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PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES

EDITED BY

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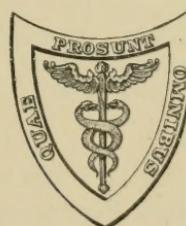
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VOLUME IV. DECEMBER, 1914

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS,
AND PERITONEUM—DISEASES OF THE KIDNEYS—GENITO-URINARY DISEASES
—SURGERY OF THE EXTREMITIES, SHOCK, ANESTHESIA, INFECTIONS,
FRACTURES AND DISLOCATIONS, AND TUMORS—PRACTICAL
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CONTENTS OF VOLUME IV

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS, AND PERITONEUM	17
BY EDWARD H. GOODMAN, M.D.	
DISEASES OF THE KIDNEYS	107
BY JOHN ROSE BRADFORD, M.D., F.R.C.P., F.R.S.	
GENITO-URINARY DISEASES	123
BY CHARLES W. BONNEY, M.D.	
SURGERY OF THE EXTREMITIES, SHOCK, ANESTHESIA, INFEC- TIONS, FRACTURES AND DISLOCATIONS, AND TUMORS . .	169
BY JOSEPH C. BLOODGOOD, M.D.	
PRACTICAL THERAPEUTIC REFERENDUM	299
BY H. R. M. LANDIS, M.D.	
INDEX	407

PROGRESSIVE MEDICINE.

DECEMBER, 1914.

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS, AND PERITONEUM.

By EDWARD H. GOODMAN, M.D.

DISEASES OF THE MOUTH AND THE ESOPHAGUS.

Diseases of the Mouth. MOUTH INFECTIONS AND THEIR RELATIONS TO CONSTITUTIONAL DISEASE. This is made the subject of an interesting paper by Hartzell,¹ who points out close association between disorders of the teeth and constitutional disease. Of a large series of cases, 120 were found to be suffering with a great variety of physical ailments. In 80 of these the disturbance ranged over the entire alimentary tract, some patients being chronic sufferers from constipation and others from diarrhea; 50 had periodic and severe migraine, with more or less nervous irritation; 40 were distinctly neurasthenic; 60 had rheumatoid pain. Of the remaining 40 cases, all showed signs of renal disease. Hartzell claims that great improvement, in practically all cases, followed careful and systematic treatment of the mouth condition. He concludes his article with this: "It seems eminently proper, therefore, that physicians should scrutinize more closely the mouths of their patients in all their routine examinations; insist on radiographic examination to discover impacted and diseased teeth; and insist on the extraction of diseased teeth unless the patient is in the hands of a competent dentist who comprehends the vital relation which diseased and impacted teeth bear to the general health of the individual."

PYORRHEA ALVEOLARIS AND RADIUM EMANATIONS. Dautwitz² has seen improvement follow the use of natural radium-containing water.

¹ Journal American Medical Association, 1913, lxi, p. 1270.

² Wien. kl. Woch., 1913, p. 843.

Diseases of the Esophagus. CARDIOSPASM. Our German confrères have inaugurated the very admirable scheme of printing what they call a "Sammelreferat" on certain topics. Quite aside from any claim for originality or literary value on the part of the writer, these reviews have certain merits, foremost among the latter being the ease with which one can keep posted as to certain diseases and conditions. The idea is one which has not been developed to any great extent in other countries.

An able "Sammelreferat" by Geppert on Cardiospasm has just made its appearance.¹ In 1901 a similar article in the same journal was written by Neumann, so that in these two papers the interested reader will find a complete literary summary of the subject. Geppert, in the paper about to be abstracted, limits his review to those papers published since 1900, amounting to eighty-three.

Since 1900 much has been written about the physiology and pathology of the esophagus, and many obscure points in the conception of cardiospasm have been cleared up. Also the progress in röntgenology has been of value in understanding the form and movements of the esophagus, anatomic-physiologic studies have increased our knowledge of the deglutition mechanism, and clinical papers have enlightened us as to the pathogenesis. Taking it all in all the paper has a definite purpose. I transcribe only the author's conclusions:

140 cases are now on record, 70 reported by Neumann and 70 by Geppert; 39 were men twenty to sixty years old, 21 women, twenty to thirty years old (three women were between thirty and forty-five), and the remaining 7 cases were seen in children from nine to sixteen years of age.

Cardiospasm may be acute or chronic, the subsequent esophageal dilatation being a result of the chronic form. The cause is generally nervous in origin. Inasmuch as the innervation of the esophagus takes place through the vagus, interference with this nerve mechanism is seen in neurosis (vagotonia), degeneration of the nerve (toxic infections, autotoxic), and reflexly in gastric ulcer and in cholelithiasis. Some hold there is a developmental failure of the esophagus, and Strauss believes dilatation can take place in an asthenic habitus, in much the same way that gasteroptosis does.

The capacity of the esophagus may range from 200 to 1500 c.c., and there is an increase of pressure during deglutition, 30 to 60 mm. Hg. as against the normal of 2 to 17 mm. Hg.

The diagnosis is made by the typical history of increasing difficulty in swallowing, by sounding, and measuring the capacity, esophagoscopic and x-ray examinations. Physical examination reveals dulness near the vertebral column, and certain auscultatory phenomena (absence of the second deglutition sound, etc.).

The prognosis is good if the patient is seen before health begins to fail. Cure is attained in 23 per cent., and improvement in 50 per cent. Com-

¹ Centralbl. f. d. Grenzgeb. d. Med. und Chir., 1914, xviii, p. 149.

plications may arise, among these being esophagitis with ulceration, carcinoma, hemorrhage, and tracheal compression.

The treatment is medical or surgical. Diet may be of assistance, and lavage with astringents and the internal use of atropin and narcotics have been recommended. Feeding by means of a tube has been successively carried out, and dilatation has been practiced with some measure of success.

I. DIVERTICULUM AND DILATATION OF THE ESOPHAGUS. Zenker's pulsion diverticulum.¹ By this is meant a blind sac arising from the otherwise normal esophagus, due to pressure from within. It begins on the posterior wall where the hypopharynx passes into the esophagus proper. The symptomatology is characteristic. There are certain prodromal symptoms consisting of mild dysphagic disturbance and catarrhal inflammations—tickling in throat, dryness, salivation, production of thick mucus, cough, and retching. When the diverticulum is well established, two groups of symptoms are seen: (a) the direct, referable to the diverticulum itself, and (b) the indirect, referable to pressure on neighboring organs.



FIG. 1.—Zenker's pulsion diverticulum.

(a) The direct symptoms include signs of stenosis and the difficulty in deglutition forces the sufferer to try all sorts of expedients in order to swallow. Regurgitation of food, particularly of food eaten at a previous meal, is always seen, and also pain. According to the capacity of the sac, a swelling is seen in the neck which may be made to disappear upon pressure. If the food remains for a considerable time in the sac, decomposition sets in and an extreme form of *fetor ex ore* is encountered.

¹ Starck, Deut. med. Woch., 1913, pp. 2496 and 2547.

(b) The indirect symptoms consist of oppression, dyspnea, congestions, and neuralgia.

In the diagnosis of a diverticulum, the *x*-rays are invaluable, but particularly useful is the esophagoscope.

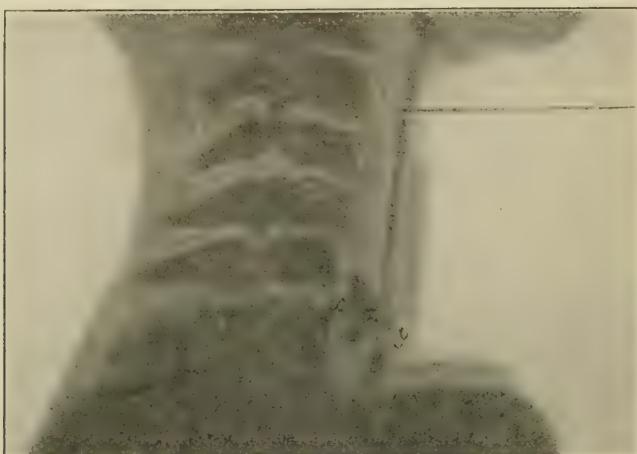


FIG. 2.—Zenker's pulsion diverticulum filled with bismuth. *x*, diverticulum; *y*, bismuth escaping from diverticulum into esophagus; *z*, threshold of diverticulum.

Starek believes operative treatment is the only one to pursue, but inasmuch as the disease is seen in those of advanced years, where operation is not without danger, there remains a wide field of usefulness for the internist. The principal indication for medical treatment lies in the treatment of the stenotic symptoms. Diet is of importance. The morsels of food should be small and soft in consistency and should be thoroughly masticated. Water should be drunk freely in order to wash the food out of the diverticulum. In this way the latter may be prevented from increasing in size. In swallowing, the difficulty may be much moderated by explaining to the patient the various methods to pursue. Some patients eat better when the head is extended, bent forward, or held to the right or left side. One patient lay on the right side, as he found he could swallow most easily when in that position. Other individuals, by pressing on the trachea in front or on the side of the neck, have learned to get the food particles down.

The patient should spend a great deal of time in eating. At times psychic factors increase dysphagia, such as strangers at table or even the family, and when such factors exist the patient will eat better when alone. A bland diet should be prescribed, alcohol, spices, and highly seasoned food being avoided, and food with indigestible residue, as fruit with seeds, salad, hard and dry food, must be eliminated. The food should not be eaten too hot.

Sounds should be used only when, despite the above-mentioned pre-

cautious, food remains in the sac. Starck has designed a special instrument by means of which the diverticulum can be thoroughly washed out. Operation is resorted to when symptoms of compression are complained of and when there is progressive emaciation. The various operative measures, which, by the by, have much to offer, are dealt with at length in the article.

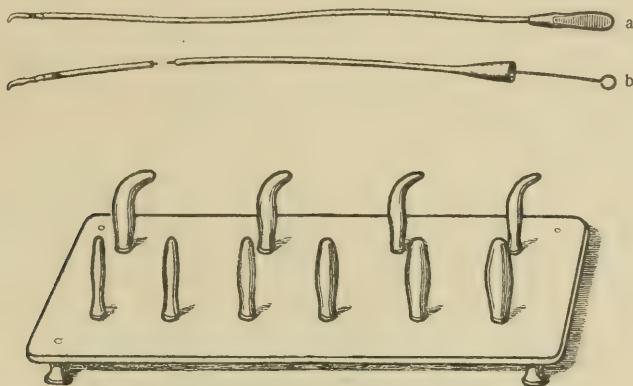


FIG. 3.—Tips for diverticulum sounds. *a*, diverticulum sound; *b*, hollow diverticulum sound.

II. DILATATION OF THE ESOPHAGUS. This condition is defined by Starck as a marked dilatation of the entire esophagus without signs of stenosis in the region of the cardia. The etiology is not understood, the clinical symptom, cardiospasm, being held to be only a factor in the production (Fig. 4).

The symptoms may be of two types:

(a) Acute onset. Suddenly after a physical or psychical trauma the patient finds that the food sticks in the throat, a phenomenon which is repeated more and more frequently.

(b) Gradual onset. There is a feeling of heaviness in the epigastrium after eating, with a sense of fulness. In both types of symptoms, marked stenotic signs are later seen.

The course of the disease is eminently chronic, lasting sometimes (in Starck's experience) thirty to forty years, with progressive difficulty in swallowing being the most characteristic symptom.

The diagnosis, generally arrived at through the history alone, is definitely made by the esophagoscope or *x*-rays.

The treatment should be directed toward the coexisting cardiospasm, which Starck thinks is caused by hyperchlorhydria in a great number of instances. Diet, carbonated water, and bromides are the three things most relied on. I might add here that I had a brilliant result in one case by the use of belladonna given shortly before eating.

When a dilatation is definitely present, there are three indications in treatment:

1. To relieve the esophagitis.
2. To prevent further dilatation.
3. To treat the narrowing of the cardia.

1. *Esophagitis.* Inflammation of the esophagus plays an important role in dilatation; it also plays a part in a *circulus vitiosus*, cardiospasm, stagnation of contents, esophagitis, cardiospasm, or in the vicious circle of esophagitis—cardiospasm-obstruction-esophagitis. Inasmuch as esophagitis is caused by food stagnation, the indications for its treatment are (a) diet, (b) removal of food from the esophagus, and (c) artificial alimentation.



FIG. 4.—Diffuse esophageal dilatation. *x*, cardia.

2. *Dilatation.* To prevent further dilatation is a difficult matter. Lavage with cold water, or with water containing CO_2 , or the use of electricity, have all been suggested as a means of securing contraction of the musculature of the esophagus, but without much practical success.

3. *Stenosis.* Often the painful cardiospasm can be alleviated by the eating of a small amount of food, and of drugs, anesthesin tablets, or the latter with bismuth may be useful. In severe cases a hypodermic of morphine is the only measure which gives relief. Mechanical dilatation with

one of the several well-known instruments—Brüning's preferred—is an effective measure.

CARCINOMA OF THE ESOPHAGUS. An analysis of 68 cases has been made by Turner.¹ A curious fact is the frequency of tumor in the upper reaches of the esophagus and the preponderance of carcinoma in women. When of the lower end, the disease seems to occur more frequently in men. Of the 68 cases, 26, or 38 per cent., were males, and 42, or 61 per cent., were females.

		Males.	Females.
Hypopharynx	26	7	19
Upper end	36	14	22
Lower end	6	5	1

Women are usually affected earlier in life than men, the majority being between the ages of thirty and fifty, while the majority of men being often fifty years of age.

Decade.	Males.	Females.
31 to 40	2	13
41 to 50	5	16
51 to 60	8	12
61 to 70	9	0
71 to 80	2	1
	—	—
	26	42

The average age at which the disease is met with in the two sexes in the different situations is shown in the next table.

	Hypopharynx.	Upper end.	Lower end.
Males	58 years.	59 years.	52 years.
Females	44 years	47 years.	48 years.

It is a curious fact that cancer of the esophagus should be more common in females, inasmuch as carcinoma of those parts of the alimentary canal lying immediately above and below the esophagus and in the contiguous larynx (tongue, fauces, or pharynx) is more frequent in men. If irritation is to be regarded as an etiological factor, it is more natural to look for such in the male sex, and excess of stimulants, imperfectly masticated and hurriedly swallowed food, may be justly regarded as more frequent causes of irritation in the male sex. Turner suggests hot tea as a possible cause of irritation in women.

The duration of the disease in the two sexes is shown in the following table:

Decade.	Males.	Females.
31 to 40	Average 1 month	Average 2 years
41 to 50	Average 6½ months	Average 3 years to 4 months
51 to 60	Average 6 months	Average 5 years
61 to 70	Average 8 months	No case
71 to 80	Average 12 months	Average 6 months

¹ Journal Laryngology, Rhinology, and Otology, 1913, vol. xxviii, p. 281.

The average duration of cancer in the various situations is as follows:

Hypopharynx.	Upper end.	Lower end.
1 year, 5 months	3 years, 6 months	8 months

Of the symptoms, the patients are occasionally conscious of a gurgling sound in connection with the act of deglutition. This phenomenon has a bad prognostic significance, indicating a narrow stricture with death a matter of but a few months (2 to 3). Regurgitation of food is also a sign of a narrow stricture. Accumulation of mucous secretion in the lower part of the pharynx is a troublesome symptom, but only rarely is the mucus found to be blood-tinged. Pain is a variable symptom. Rapidly progressing emaciation is a common finding. Cough and hoarseness are late symptoms.

Of the physical examination, the most important measures are the use of the laryngoscope, bougies, *x*-rays, and esophagoscope.

SPONTANEOUS RUPTURE OF THE HEALTHY ESOPHAGUS. To the 22 cases now on record, Walker adds another.¹ Those cases of postmortem digestion of tissues and those cases of esophagomalacia have been excluded in his compilation.

The disease is seen most frequently in men who have been addicted to alcohol. In practically every case rupture has followed vomiting or retching after an unusually large meal, and the point of rupture in every case has been just above the diaphragm, the weakest section of the esophagus. The prognosis is practically hopeless.

DISEASES OF THE STOMACH.

Gastric Ulcer. EXPERIMENTAL PRODUCTION OF GASTRIC ULCER. Since 1830, when Cruveilhier first drew attention to round ulcer of the stomach as a disease entity, hundreds of investigators the world over have attempted, clinically and experimentally, to explain its etiology and pathogenesis. Among some of the opinions expressed are, that the ulcer is associated with uremic states (Mathieu and Roux), tuberculosis (Arloing), nerve changes (Hayem, Bernard), heredity (Huber), and appendicular disease (Mahnert). All sorts of foreign substances, organic and inorganic, have been used to produce ulcerations, and unfortunately for the progress of our knowledge, all seem to be followed by success. The researches continue to multiply from year to year, but, apart from theorizing on the basis of the experimental findings, nothing fundamental seems to have been achieved.

1. *Pyloric Disharmony.* (a) *Pylorospasm.* Kehrer² believing that the primary cause of ulcer might be a disturbance in the motor functioning of the stomach, has devised an ingenious method for exciting pyloro-

¹ Journal American Medical Association, 1914, lxii, p. 1952.

² Mitt. a. d. Grenzgeb., 1914, xxvii p. 679.

spasm with retention of acid contents, and with a resultant forceful and persistent contraction of the gastric muscularis. His thought is that by these powerful contractions the large arteries are compressed, leading to local anemia, necrosis, and ulcer.

His operative procedure consists in leading the pancreatic and biliary secretions away from the duodenum, so that alkaline duodenal juices can not play their parts in the pyloric reflex (Cannon). The pancreatic duct is transplanted in the appendix and the gall-bladder in the ileum (Fig. 5).

Fifteen dogs were thus treated, nine of which lived from nine to fifteen days without any macroscopic changes being seen in the stomach, while six showed unmistakable signs of ulcerations. Certain symptoms made

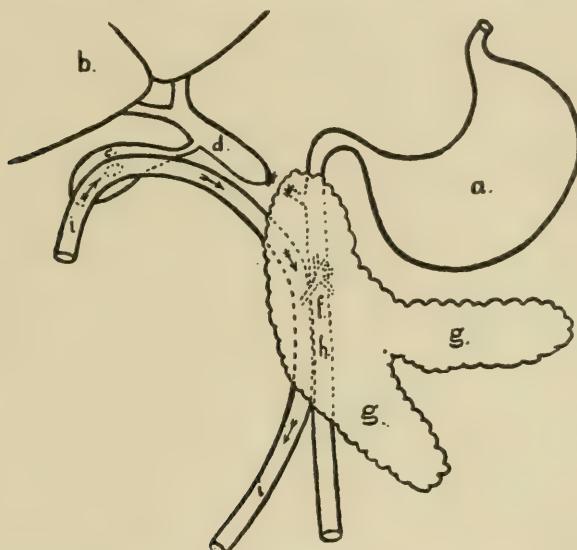


FIG. 5.—*a*, stomach; *b*, liver; *c*, gall-bladder; *d*, common duct; *f*, pancreatic duct; *g*, pancreas; *h*, duodenum; *i*, loop of ileum.

their appearance, such as loss of appetite, care as to what kind of food to eat, vomiting, progressive emaciation, which were distinctly referable to the ulcerations. Kehrer interprets these findings as indicating that there was a temporary cutting-off of the blood-supply by the increased muscular contraction, which, with the hyperacidity produced, caused eventually digestion of portions of the gastric mucosa (ulcer).

(b) *Pyloric Insufficiency*. Instead of the pylorospasm with resultant vascular compression being the cause of ulcer, Stuber¹ believes that pyloric insufficiency, permitting of the regurgitation of intestinal ferments into the stomach, is the underlying feature. He has imitated this insuffi-

¹ Münch. med. Woch., 1914, p. 1265.

ciency in animals, and, by neutralizing the gastric juice, he has found typical ulcers arising in the region of the pylorus.

2. *Adrenals and Gastric Ulcer.* In numerous experiments with adrenalectomy, Finzi¹ has been able uniformly to produce ulcerations of the stomach. He believes his work points to changes in the circulation of the mucosa following extirpation of the adrenals, which changes progressively lead to necrosis and ulceration. When both adrenals are removed the ulcer shows no sign of healing, while when the extirpation is unilateral, efforts at healing are observed. In one rabbit, despite the adrenalectomy, there was no indication of adrenal insufficiency, and in this animal no ulcer was produced. An interesting observation is that when adrenalectomized animals receive adrenalin subcutaneously, or have an adrenal transplantation, no ulcers develop. These astounding results are worthy of the closest study, and the work should be carefully repeated.

One's first thought is, naturally, what changes are seen in the adrenals in clinical cases of ulcer? The author has examined five cases of human gastroduodenal ulceration and found notable changes in the adrenals, namely, chronic thickening of the capsule, nodular hypertrophy, embolism, fatty degeneration, congestive and multiple hemorrhages.

Some years ago an attempt was made by the German school to explain nephritic hypertension by changes in the adrenals, and, although in some cases of nephritis are associated with adrenal disease, the association was later proved to be so irregular and inconclusive that the theory has been practically abandoned. Will it be the same with Finzi's work? His uniform results in forty-five rabbits, numerically, are noteworthy. Not so conclusive, however, are his five clinical cases. They may be sufficient to confirm him in his theory, but future work alone can decide the true significance of these adrenal changes described by him, in their relation to gastroduodenal ulceration.

3. *Antipepsin.* Kawamura² has followed Katzenstein's line of thought,³ and agrees in the main with his idea of an antipeptic substance preventing local digestion of the gastric mucosa. He believes that it is always in the blood and in all organs, and that gastric ulcers arise first on account of some circulatory disturbance (local) which prevents the antipepsin from reaching that particular focus in the stomach, and hence, peptic digestion goes on.

4. *Tetrahydro-B-naphthylamine Hydrochloride.* When injected into rabbits, this drug (B-tetra) produces ulcers within two hours, and occasionally in the colon, cecum, and duodenum as well.⁴ Within such a short time it is not possible to have had septic infection, so that this complication does not confuse the study. The ulcer first begins by necrosis of the

¹ Virchow's Arch., 1913, cxciv, p. 413.

² Mitt. a. d. Grenzgeb., 1913, xxvi, p. 379.

³ See PROGRESSIVE MEDICINE, 1913, p. 28.

⁴ Elliott, Quarterly Journal of Medicine, 1914, vii, p. 119.

surface epithelium, and, from this time, the course of the ulcer seems dependent on the digestion of the damaged mucosa by the gastric juice, confirming the well-known work of Bolton. An additional support to this belief is, that when the animals were starved (no gastric juice) ulcers were not produced.

5. *Clumped Colon Bacilli*. There are two papers by Steinhaber.¹ In the first, he makes a preliminary report, dealing with the intravenous injection of colon bacilli, and promising work done with the introduction of these organisms by mouth, rectum, subcutaneously and intraperitoneally. The second paper elaborates on the first but reports only work done with the intravenous method. Unfortunately, there is no fulfillment of the promise of the first paper. Intravenous injections caused ulcers to form very rapidly (within twenty-two hours) in all rabbits injected. He concludes: "When it is recognized that there probably is a continual absorption of the colon organism and its toxins through the wall of the intestinal tract, that possibly the absorption is increased and the strain of the usual colon organism is modified during constipation, and that a high percentage of ulcer cases give a history of constipation which in many instances antedates gastric symptoms, it becomes natural to suppose that the colon bacillus may be the etiologic factor in the production of gastric ulcerations in human beings."

If this is so the query arises, in how many cases of chronic intestinal stasis (Lane) does one find gastric ulcer? My answer would be: In very few, and I feel that if the association were as pronounced as Steinhaber, from his three experiments, is led to believe, the presence of gastric ulcer in conditions mentioned above could not well have been overlooked.

6. *Streptococci*. Rosenow² calls attention to the fact: "Hemorrhage, superficial erosions, and definite ulceration of the mucous membrane of the stomach and duodenum occur not infrequently during severe infections in man and in experimentally infected or otherwise severely intoxicated animals. In some of these instances there can be no question but that infection plays a role in the etiology of ulcer. Ulcer also has been produced experimentally by injecting bacteria into the gastric artery. The association of mouth and tonsillar infections with ulcer of the stomach has been emphasized. It is said that ulcer of the stomach is more common in regions in which throat infections are particularly prevalent. Clinicians have observed aggravations of symptoms in ulcer of the stomach or duodenum following sore throat. Experimental proof, however, showing that certain bacteria may have a special affinity for the stomach mucous membrane, producing a localized infection, and hence may play a role in the causation of the common acute and chronic peptic ulcer in man when the usual symptoms of infection are slight or wholly absent, has not been

¹ Boston Medical and Surgical Journal, 1913, clxix, p. 81; Lancet-Clinic, 1914, ci, p. 88.

² Journal American Medical Association, 1913, lxi, p. 1947.

brought forward." For these reasons, Rosenow has made a study of the effect of injections of steptococci on the stomach.

He has found that, given intravenously, steptococci may produce ulcers of the stomach and duodenum, the ulcer being caused by a primary infection and secondary digestion. The ulcers are usually deep and single and show a marked tendency to hemorrhage and perforation.

HEREDITY IN GASTRIC ULCER. Dauwe¹ insists that heredity plays an important role in gastric ulcer, and is disappointed and aggrieved that this fact is not discussed in books and articles devoted to the study of this condition. He is pleased to report eight cases, the diagnosis of all being, "Ulcère hereditaire," in all of whom he found a family history of ulcer. On just what clinical facts he bases the diagnosis of a gastric ulcer in the parents of his subject he does not state. He seems content with saying, "Mother died at sixty-five years of age, had suffered from gastric ulcer" (Case VIII, p. 380). "Father suffered with gastric ulcer—died young" (Case VII, p. 380).

In this last-named instance, the patient was observed in 1907, and was aged thirty years at that time. The father must have died somewhere in the early eighties therefore. Diagnosis of gastric ulcer was then, as is now, applied to all sorts and conditions of stomach trouble, and unless the case was definitely known to have been ulcer, it is hardly scientific to accept a lay person's diagnosis of an illness, particularly when the patient's father died when the former must have been a small child. Before our author's claims to distinction as the discoverer of a new (?) etiological factor for gastric ulcer, he must convince his readers that the diagnosis of parental disease is accurate and not a family tradition or a family fiction. Besides, eight cases, no matter how coincidental some gastric symptoms which might be mistaken for ulcer may be, do not justify one in ascribing to these coincidences any greater value than a coincidence deserves.

See also an article by Huber² in which he is convinced of an hereditary influence.

GASTRIC DISTURBANCE AFTER GASTRO-ENTEROSTOMY. In a certain number of cases, operation seems to be followed by symptoms more aggravated and more distressing than those of which the patient complained, before a gastro-enterostomy was performed. Mathieu and Savignac³ group these patients into two classes, (1) those with diarrhea and (2) those with dyspeptic symptoms. Both of these postoperative complications the authors believe to be due to alterations in digestion, produced by the operation; that is, that there is insufficient gastric juice for complete gastric digestion, on account of its being expelled too rapidly into the intestine. This rapid emptying tends to irritate the intestine at the

¹ Archives des Mal. de l'App. Dig., 1913, vii, p. 375.

² Correspondenzbl. f. Schweizer Aerzte, 1914, p. 129.

³ Arch. de Mal. de l'App. Dig., 1913, vii, p. 541.

stomach-bowel opening, and a severe enteritis results, with all the distressing symptoms with which such a condition is associated.

Mallory¹ holds a different and more modern view, namely, that vagotonia is at the bottom of the trouble. In this condition, described by Eppinger and Hess in 1910, "There exists a state of affairs corresponding to excessive vagus stimulation, or a stimulative vagus neurosis, and while this manifests itself in other regions corresponding to the wide distribution of the nerve, our present concern is with the effect on the stomach. As one might suppose, both the motor and secretory functions are increased. There is usually hyperacidity, pylorospasm, and increased muscle tone, with occasional spastic contraction. These patients say that they cannot take much food, the stomach feels full after even a small meal, and there is a knot in the throat, cramping the epigastrium, a feeling of tightness and constriction in the thorax, cardiac disturbance, and the eructation of gas. Vomiting often occurs soon after eating, and is especially apt to be produced by excitement or anxiety."

"Röntgenoscopy reveals a short stomach which fills with bismuth slowly, a mere thread trickling down toward the pyloric region, the stomach wall is tightly contracted around the contents, and the gas bubble in the fundus is small. Antiperistalsis and vomiting sometimes occur during examination."

Mallory believes that vagotony is the reason why certain cases do poorly after operation, and he suggests that all ulcer cases he examined for signs of this condition, and, if present, such cases should be denied operation unless surgical interference is imperative. The diagnosis is easy, and, in addition to the gastric signs given above, either a few or all of the following may be noted: Bradycardia, disturbances in the respiratory rhythm, a tendency to bronchial asthma, dermographia, urticaria, local sweating, Head's zones, low blood-pressure, pigmentation of the skin, eosinophilia, spastic constipation, alternating with nervous diarrhea.

RECURRANCE OF ULCER AFTER GASTRO-ENTEROSTOMY. Four cases of this unfortunate accident are reported by Filadoro.² One of the patients succumbed to peritonitis from the recurring ulcer, one refused a second operation, in the third, the new opening was found entirely obstructed, and in the fourth, adhesions interfered with the functioning of the new opening.

PERFORATED GASTRIC ULCER. Brenner³ emphasizes the early appearance of a diaphragmatic friction rub, a sign first described by Buchanan and Bickarstith, and later, more closely studied by Brunner.⁴ In six cases reported by Ryser⁵ this sign was either not present or its significance was not appreciated, as he makes no mention of it.

¹ Journal American Medical Association, 1914, lxii, p. 1883.

² Abstract Journal American Medical Association, 1913, lxi, p. 911.

³ Wien. kl. Woch., 1913, p. 1973.

⁴ Ztsch. f. Chir., 1903.

⁵ Corbl. f. Schw. Aerzte., 1903, ii, p. 961.

LOCALIZATION OF GASTRIC ULCER. 1. If the patient has the most pain on pressure over the fourth, fifth, sixth, and seventh thoracic vertebræ and their transverse processes the ulcer is situated on the lesser curvature.

2. If there is pain present as far as the tenth vertebra the ulcer is in the wall of the stomach.

3. If there is pain between the tenth and twelfth vertebræ the ulcer is located on the greater curvature at the pyloric region.¹

TREATMENT OF GASTRIC ULCER. There have been numerous articles written on this subject, but they have presented nothing new, and one must therefore conclude that in the direction of therapy we have made no progress during the past twelve months.

Carcinoma of the Stomach. "Carcinoma of the stomach must be diagnosed early if surgery is to be of any assistance in its eradication. What constitutes such a diagnosis should no longer be considered a moot question. A diagnosis can not be regarded as early if one bases it on the absence of a palpable tumor, as many cases of advanced carcinoma are seen with negative palpating signs. Nor can one claim that he has recognized the condition early when he can find no evidence of metastasis, as apparent metastasis may be lacking, and yet the operation may disclose such general involvement that talk of early diagnosis is soon hushed. There are two criteria by which a timely diagnosis must be judged: (1) radical procedures must be followed by a lowered mortality, and (2) there must be shown that the duration of life is prolonged after such operations. Only when these conditions are fulfilled may one be content with his standard."²

While believing that research devoted to the invention of early tests is imperative, I feel strongly that one should not lose sight of the fact that he has always in his hands means of diagnosis which are in nowise inferior to those of the laboratory worker, namely, history and physical examination. I³ have reported this year the histories of twelve cases, all with what might be termed acute symptoms. The shortest time of illness was two days and the longest was ten months. All proved to be inoperable. In this paper a plea was made for the recognition of early symptoms and early operation:

"When an individual past forty years of age who has previously been healthy, as far as the stomach was concerned, or who has been complaining for years of indigestion, begins to complain of gastric trouble of acute onset and persistent duration, or of acute aggravation of previous symptoms, he should be suspected of having cancer. Patients are often uncertain of their previous gastric symptoms, and remember only a sudden attack which they refer definitely to an indiscretion in eating or drinking, and in an individual of middle life such a history should be regarded with great suspicion. To suspect cancer is one thing, to prove it another, and,

¹ Openchowski, *Münch. med. Woch.*, 1913, p. 2606.

² Goodman, *Archives of Diagnosis*, April, 1914.

³ Loc. cit.

unfortunately, positive proof in the early stages is lacking. I feel strongly that if a patient past middle life, with a history like that given above, does not improve on proper diet and dedication, and continues to complain of unabated or aggravated symptoms, a surgeon should be consulted after a week or two and the advisability of exploratory laparotomy thoughtfully considered.

"Surgeons are not unwilling to undertake such operations, although realizing that the latter are not devoid of danger to the patient (mortality 1.6 per cent.). Mayo, in a recent paper, says, 'The diagnosis of cancer of the stomach can not often be made early enough to obtain a radical cure by operation, but a diagnosis of some condition of a surgical nature, probably cancer, can be made in time to permit operative interference in more than one-third of all cases.' Exploratory incision is, after all, the final test, and while it is a difficult task for the diagnostician to decide which case shall have this performed, still the internist finds assurance and offers of ready assistance from his surgical confrères. Rodman, in the discussion of Mayo's paper, advises more frequent laparotomies, and Deaver says, 'To perform an exploratory operation is practically taking no risk at all.' With this favorable attitude on the part of the surgeon, it behooves the diagnostician to balance carefully the evidence before him, and to remember that, although food retention, x -rays, and test meals are of some assistance, the early diagnosis, if made at all, will be made not on signs of equivocal significance, but on symptoms of undoubted value. One might almost say in this disease, as in duodenal ulcer, history is everything."

CARDIAC SIGN IN CANCER. This sign, which I¹ described in detail last year, has been employed by its originator, Gordon,² in fifty consecutive cases, with only 6 per cent. of error. This diagnostic sign appears to have attracted but little attention, as, apart from Gordon's writings, there seems to have been no other communication on the subject.

X-RAY EXAMINATION. "Gastric carcinoma offers one of the most satisfactory conditions for x -ray study, and I shall never fail to use the latter in any case of cancer of the stomach. Although a certain amount of training is necessary before one obtains perfect results, we have never found a normal stomach shadow in any case of neoplasm. The shadows obtained are not accidental, but are those definitely produced by the action of the tumor on the muscular coat of the stomach. Experience has taught us that only in a small proportion of cases do we obtain what may be termed pathognomonic pictures, the greater proportion are only *suspicious* of cancer. In many instances, shadows are seen which are observed frequently in other intra- and extragastric diseases, and the results of the x -ray examination are to be considered not as infallible signs of carcinoma, but are to be regarded merely as corroborative of other clinical data. Röntgenoscopy is to be used in combination with the anamnesis,

¹ PROGRESSIVE MEDICINE, 1913, p. 47.

² Lancet, 1914, i, p. 161.

inspection, palpation, and gastric analysis, and should not be used alone as a basis for diagnosis. We have come more and more to the opinion that just as one can diagnose but rarely a condition on one symptom alone, but rather must base conclusions on several facts, just so can one in only a few cases make a diagnosis by the *x*-rays alone. . . . In all suspicious cases of carcinoma the *x*-rays should be early employed, and only in such cases where there are positive *x*-ray findings can a diagnosis be made, as negative results do not exclude beginning malignancy. When carcinoma has invaded only the mucosa, and has grown to a size no larger than the size of a dime (*pfenningstück*), there are no changes in the stomach picture, hence the *x*-rays are but little use in making an early diagnosis.¹

CYTODIAGNOSIS OF GASTRIC CANCER. In the subsequent pages will be found a description of the technique of the method as given by Loeper and Binet. Simon² has confirmed their findings as they apply to the diagnosis of carcinoma. Twenty-five positive results were obtained twenty-four of which cases were found to have carcinoma, while the twenty-fifth had no lesion of the stomach. Simon explains the wrong conclusions, in this mistaken case, on faulty technique.

SPECIFIC LABORATORY TESTS FOR CARCINOMA. During the past year there have been no new tests for the "early" diagnosis of carcinoma, but those engaged in cancer research have been content to report simply the number of times a certain test has occurred in cases of cancer, without emphasizing unduly its significance as an early sign. The work of the year seems less hectic, and conclusions sound a saner and more conservative note than before. The authors have not let their zeal lead them into rash, unqualified judgments, and are holding opinions, temperately expressed, rather than being held by them. I have not reviewed all of the tests reported during the past twelve months, as some do not seem to promise much, but have selected certain articles, of which I give an abstract without any critical comment.

Wolff-Junghans Test. This test, about which much has been written, and of which much has been expected, has been thoroughly studied by Smithies³ in the Mayo clinic. His work was confined, to 147 cases, whose gastric contents showed achylia or whose symptoms suggested malignancy. Theoretically, the procedure has the following basis: In the normal aspirated test meal there are large quantities of albumin, soluble albumin, which appears only through the agency of the gastric ferments. In malignant achylas, aspirated test meals are said to be rich in soluble albumin, while in benign achylas very little of the albumin can be demonstrated.

Three suppositions are advanced to explain this phenomenon: It has been suggested that the excess of albumin is due (1) to interference with

¹ Schüller, *Ztsch. f. kl. Med.*, 1913, lxxviii, p. 309.

² *Presse Méd.*, 1914, p. 265.

³ *American Journal Medical Sciences*, 1914, cxlvii, p. 713.

albuminous reabsorption, (2) to a "cancer milk," rich in albumin, which exudes from malignant growths, and (3) to a specific peptid-splitting ferment, from the neoplasm, capable of carrying protein digestion as far as the completely soluble albumin stage.

Smithies concludes that positive results may be expected in 80 per cent. of gastric carcinomata. Soluble albumin was, in his hands, a more constant finding than absent hydrochloric acid, lactic acid, and the glycyltryptophan test. It was rather more constant than tests for occult blood and the demonstration of gastric inefficiency (motility). It was not so consistent in its manifestation as the demonstration of organisms of the Boas-Oppler group, or as in the increase of the formol index. In extragastric malignancy, gastric syphilis, and nephritis, the test is inconstant. As a means of differentiating between malignant and non-malignant conditions, when used in connection with other clinical and laboratory data, it is of considerable value.

Simple gastric and duodenal ulcer, especially when accompanied by pyloric stenosis or gastric atony, may give confusing responses to the Wolff-Junghans test. The presence of blood in the gastric contents may be a factor in the production of certain atypical positive tests.

Colloidal Nitrogen (Salkowski's and Kojo's Test). One hundred c.c. of a twenty-four-hour specimen of urine freed of albumin are saturated with zinc chlorid and allowed to stand twenty-four hours. The mixture is filtered and the residue on the filter paper is washed five times with saturated zinc chlorid. The filter paper plus the precipitate are examined for colloidal nitrogen (Kjeldahl). The total nitrogen is also determined in the same urine and the two compared. In health, CN : TN = 1.32, while in cancer the ratio equals 4.08 and above.

Two papers have been written¹ during the past year, with practically the same conclusion, that the test is not specific for carcinoma. Lehmann made the important discovery that by increasing the amount of purin-containing food, the amount of colloidal nitrogen can be so much increased that high values, such as are supposed to be encountered only in carcinoma, are readily obtained. Perhaps, with a diet low in purin, the test may have a value, but no work has been done in this direction. Semenow believes that a normal coefficient, where the colloidal nitrogen does not exceed 1.79 per cent. of the total nitrogen, indicates the absence of malignancy.

The Salomon-Saxl Urine-sulphur Test. Pasetti² applied this test in 200 cases, including 46 cancer cases, 35 of surgical tuberculosis, 92 of other surgical affections, and 27 cases of syphilis (positive Wassermann reaction). Among the latter, the report was negative in all but 2, in surgical tuberculosis, negative results were obtained in over 88 per cent., while the

¹ Semenow, Berl. kl. Woch., 1913, p. 1436; D. Lehmann, Arch. f. kl. Med., 1913, cxii, p. 376.

² Abstract Journal American Medical Association, 1913, lxi, p. 2113.

reaction was constantly positive in 68.7 per cent. of the carcinoma patients and in 35.7 per cent. of the sarcoma cases. This test is so easy and so simple, and the findings are so frequently positive in cancer and negative when there is no malignancy, that Pasetti regards it very highly in the differentiation of malignant neoplasm. The details of the technique were described in the *Journal of the American Medical Association*, 1911, May 27, p. 1593.

Meiostagmin Reaction (Ascoli's Test). With this reaction, 96.8 per cent. of all carcinoma patients give positive results, but the sad part is, that a large percentage of other diseases give positive findings, notably all cases of pregnancy, chronic osteomyelitis, and certain constitutional diseases like diabetes. Sarcoma gives varying results. Negative findings would seem to speak against the probability of carcinoma but not sarcoma, while positive tests have little value.¹

Epiphanin Reaction (Weichardt's Test). This test, devised for the detection of specific antibodies according to Józsu and Tokeoka,² seems to be negative in the majority of non-carcinomatous cases and positive in about 81.5 per cent. of all cases of malignancy.

Edestin and Pepton. The use of these two substances in differentiating and estimating proteolytic and peptolytic cleavage has been suggested by Friedmann and Hamburger.³ Two c.c. of the edestin solution (0.1 per cent. solution in 0.1 per cent. sodium carbonate) are placed in each of four test-tubes and the neutralized gastric filtrate added in decreasing amounts of 2 c.c., 1 c.c., 0.5 c.c., respectively, to the first three tubes, the fourth containing edestin and carbonate alone ($\frac{n}{100}$ Na₂CO₃) serving as control. All four tubes are made up to an equivalent volume with a 1 per cent. carbonate solution, placed in an incubator at 37° C. and allowed to remain four hours. Proteolysis is estimated by the precipitation of unhydrolyzed edestin by the addition of 5 per cent. acetic acid. Complete absence of cloudiness after neutralization indicating complete digestion; slight turbidity, partial digestion; maximum turbidity, as compared with the control, no digestion.

The estimation of peptolysis is performed as follows: 10 c.c. of the gastric filtrate are added to 20 c.c. of a 2 per cent. pepton solution and 10 c.c. of the mixture used as control and titrated for free amino groups by the formol method. The remaining 20 c.c. are placed in an Erlenmayer flask under toluol at 37° C. for twenty-four hours. At the end of this time, 10 c.c. are removed and titrated, the difference between the control titration and the second titration expresses the degree of peptolysis in terms of c.c. $\frac{n}{10}$ NaOH per 100 c.c. of the mixture.

Moderately advanced and advanced cancer of the stomach, involving the pyloric portion associated with low acidity and low or absent free HCl, produces the greatest pepton cleavage. Early cancer, situated on

¹ Roosen and Blumenthal, *Deutsch. med. Woch.*, 1914, p. 588.

² *Ibid.*, p. 590.

³ *Arch. Int. Med.*, 1913, xii, p. 346.

the lesser curvature between the pylorus and cardia, possibly developing on an ulcer basis, with high total acidity and low or absent free HCl, gives the least. In chronic ulcer of the stomach and duodenum, there is practically no proteolytic or peptolytic cleavage.

According to the authors, the edestin-pepton method possesses a distinct value in the diagnosis of the stomach and serves well to distinguish between benign and malignant an acidity. High peptolysis with low proteolysis speaks for carcinoma; high peptolysis with high proteolysis against malignancy. The authors are wise in stating that the test has a practical value only when taken in conjunction with the usual clinical and laboratory data.

Glycyltryptophan Test. A recent article by Hauschild¹ shows that the test has too many sources of error, and is too difficult to have much value. It is utterly useless as an early sign of carcinoma, and even in the recognition of advanced cancer its value is problematical.

This test, like so many others which have been studied with a view to the early diagnosis of cancer of the stomach, is tottering on the brink of oblivion, and the time seems not far distant when it will have taken its place in the obscure recesses which are crowded with the mass of abandoned "early tests."

Linitis Plastica, or Leather-bottle Stomach. This fantastic name was invented by Brinton, of Philadelphia, in 1854, for a condition of the stomach which he did not understand. Bland-Sutton² has devoted a lecture to this rare disease in which unusually good illustrations are shown. "The stomach of an adult is 12 inches long and 5 inches wide, and its walls are about $\frac{1}{2}$ inch thick. In the living body the stomach is pink, glistening, soft, very vascular, and has a capacity of forty fluid-ounces. The stomach, which is the subject of our observation (Fig. 6), measures 4 inches in length, 2 inches in width, and in places its walls are an inch in thickness. Instead of being flexible, its walls are rigid, thick, and hard like a leather pouch. When pressed upon the wall does not collapse, and, as Brinton pointed out, it resists even considerable pressure, and returns to its original shape like a large artery or a caoutchouc bottle. So shrunk is this stomach that it has a capacity of four instead of forty ounces. The thickening involves the gastric wall from the cardiac opening to the pylorus. At the pyloric end it is sharply defined, and the thin walls of the duodenum are in striking contrast to the thickness of the walls of the stomach."

The exact nature of the disease has been much discussed, some writers believing it to be inflammatory in origin, others regarding it as a diffuse form of cancer, a few considering it to be syphilitic, and a small minority describing it as a form of tuberculosis.

¹ Arch. f. Verdkr., 1914, xx, p. 179.

² British Medical Journal, 1914, i, p. 229.

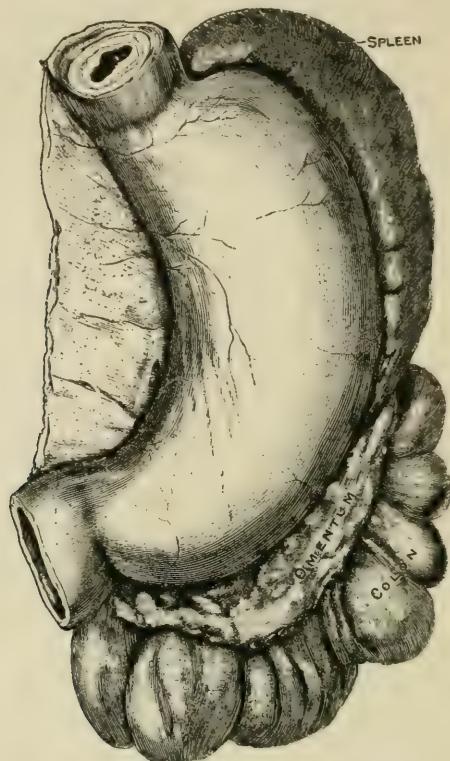


FIG. 6.—Stomach, one-third natural size.

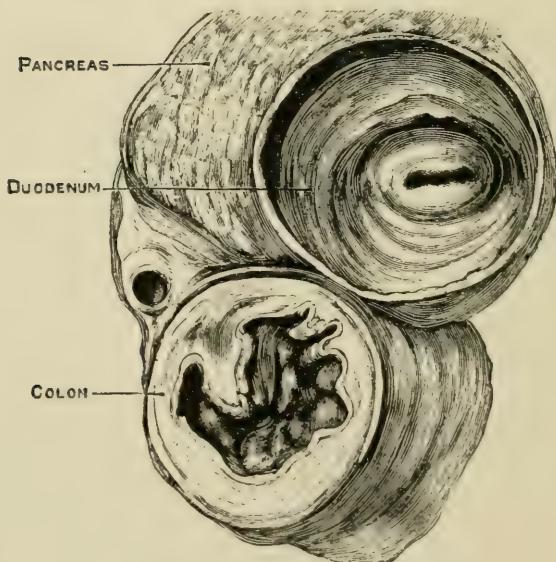


FIG. 7

Bland-Sutton's case has been subjected to minute study, and he is satisfied that the changes seen are due to the infiltration of its coats with spheroidal-celled cancer. It was impossible to determine the particular part of the mucous membrane in which the morbid change began.

Cytodiagnosis of the Stomach. This means of examination we own principally to Loeper and Binet.¹ In a later paper,² they continue the report of their researches, and it is this second paper which I now abstract.

The patient must have had nothing to eat for at least twelve hours, at the end of which time a stomach-tube is introduced, with the least possible disturbance to the patient. Through it 250 to 300 c.c. of distilled water are poured in and immediately siphoned off and kept. Often the wash-water is recovered perfectly clear, or at most, containing small particles of mucus or saliva. Frequently it is opaque, yellowish or greenish in tint, holding in suspension some food particles. In the first event, no further lavage is necessary; in the second, however, a second washing is performed with an equal amount of water. In cases of aggravated retention a third washing will perhaps be necessary before the gastric cavity is sufficiently cleansed. All washings subsequent to the first lavage are to be discarded.

When the stomach is clean, one introduces 250 to 300 c.c. of salt solution (0.7 per cent.) and a few seconds later this is withdrawn and placed in a second receptacle. Usually only 30 to 40 c.c. are recovered (?). In the first washing, chemical tests may be made, but the second water is to be used only for the cytologic examination. After allowing it to stand for a short while, in order to permit any suspended particles to fall to the bottom, enough is now pipetted off to fill a centrifuge tube, and is centrifugated for ten to fifteen minutes. The sediment is placed on two slides, then fixed by heat and alcohol, the one being examined in the unstained state and the other being stained.

NORMAL CASES. In health, the mucosa functionates as the authors say "de façon silencieuse" without desquamation, without formation of new cells, without hypersecretion of mucus; in a word, without any cytologic reaction.

DYSPEPSIA. This bad term is used as a definition of disturbances of digestion for which one is unable to find an organic cause. It is but natural to suppose that there would be no change in the gastric mucosa. There are always some cells from the mouth or esophagus which enter the stomach through deglutition, but one never sees any true gastric cells.

GASTRITIS. In distinguishing between pure dyspepsias and dyspepsias of gastric origin, the authors believe their method will be found useful. In all cases of gastritis one finds one of four cytologic features; hyperproduction of mucus, hyperproduction of cells, leukocytic or erythrocytic. Based on these, four forms of gastritis are described:

¹ Bull. de la Soc. méd. des hôp. de Paris, 1911, May 5.

² Arch. des Mal. de l'App. Dig., 1914, viii, p. 181.

1. *Mucous Gastritis*. This is characterized by the extreme abundance of a substance colored pink by eosin and violet by gentian violet, in which is enmeshed debris of vacuolated protoplasmal cells, or cells from the mucosa. It is the association of the mucus and the cells which permits one to regard this mucorrhea as evidence of lesion of the mucosa.

2. *Hypergenetic and Desquamative Gastritis* (gastrite hypergénétique et desquamative). These terms are used together, as it is difficult to say from an examination of a cover-slip if there is excessive desquamation or excessive cell production. The important feature is, that these cells come from the gastric mucosa and are present in abnormal numbers. The cellular elements are for the most part rounded or polygonal, with flattened angles, their contours are not regular, and the protoplasm seems to escape from its envelope. They are rose-tinted with eosin and contain fine granulations. They seem to be poorly nourished, are brittle, and are rich in chromatin. No cells have been encountered such as are depicted in the books as being basal cells.

3. *Diapedetic Gastritis* (gastrite diapédétique). In this condition the leukocytes are very numerous, polynuclears, lymphocytes, and eosinophiles, generally with a preponderance of polynuclear cells. Eosinophiles are rarely seen. The granules are regular, homogeneous, and stain intensely pink.

4. *Congestive Gastritis* (gastrite congestive). This form is characterized by the presence of erythrocytes indicating an unusual frailty of the mucosa with dilatation of capillaries. In cases in which the cells arise from a recent traumatism or rupture of a vessel their form is intact, and they stain intensely and uniformly. When they arise from an irritative lesion, they seem poor in hemoglobin, difficult to stain, and their outline is not sharply marked.

GASTRIC ULCER. In twelve cases examined, the cytologic picture has been the same. Small numbers of epithelial cells, large quantities of leukocytes, and a variable number of red cells. When gastritis is associated, the epithelial cells are more numerous, and the picture approaches that seen in the congestive and diapedetic type of gastritis mentioned above. When the ulcer begins to heal, the leukocytes, the blood cells, and the epithelial debris decrease progressively. As a means of recognizing a latent ulcer, the method is valuable.

CANCEROUS ULCER. In certain cases of old ulcer, one sometimes sees large cells staining deeply and densely, whose outlines are not well preserved. This finding is held to be indicative of an adenomatous reaction taking place about the ulcer, and does not of itself indicate a cancerous change. It has a prognostic significance, however, and the authors advise operation when these cells are found.

CANCER. A cytologic examination is able to diagnose not only carcinoma, but the kind of cancer. In all cases of neoplasm one finds sharply defined cells, rich in chromatin granules, with typical karyokinetic figures.

Cylindrical cells are also seen, and also vacuolated structures of round contours. There are numerous illustrations in the article which picture the cells very accurately.

Gastric Diagnosis Controlled by Operation. A very careful study has been made by Schmieden, Ehrmann, and Ehrenreich¹ of cases which require operative interference. The object in mind was to make on such cases a painstaking examination, and later to test the value of these results at operation. In the examination were included: careful history testing of the gastric function, particularly of the chemistry and motility, occult blood, palpation, and *x-ray* examination. If the three authors were undecided about the diagnosis, the several opinions were noted, and the correctness or incorrectness discussed, following the data acquired after opening the abdomen. In all, forty patients were thus studied, and the results tabulated in certain tables.

HISTORY. Attention is called to the relatively short illness in cases of carcinoma, unless ulcer and complications thereof are associated with a history of stomach trouble of long duration. Thus, oftentimes acute onset of carcinoma has been very striking in a series of cases reported by me and abstracted in preceding pages of this number of PROGRESSIVE MEDICINE. Of the 14 cases of carcinoma, 9 were ill from one to seven months, 3 from eight to fifteen months, 1 for twenty-one months, and 1 for sixteen years; while of the benign affection, 4 were sick two to twelve months, 10 for three to ten years, and 6 for eleven to thirty-six years. The conclusion is reached that if a stomach trouble has persisted for many years, it speaks more for ulcer than for carcinoma, with, of course, the possibility being ever present that an ulcer may degenerate into cancer.

AGE. In general, the cancer cases were over fifty years of age, but the age factor must be considered of doubtful diagnostic significance. One case of cancer was twenty-eight years old, while one case of ulcer was seventy-two years old.

LOSS OF WEIGHT. This is of but little value, the same feature of sudden loss of weight being seen in the benign as in the malignant cases.

SYMPTOMATOLOGY. The authors find, as I observed in my series of cases, that the symptomatology of gastric cancer is far from being characteristic, and it is noteworthy how few symptoms were complained of. In ulcer, the characteristic "hunger pain," about which so much has been written, is often missing, and has been found to be present when there is no ulcer, or when there is ulcer of the stomach. The authors do not agree, by any means, that "history is everything" in duodenal ulcer.

The tender point to the right of the umbilicus has been found more often in duodenal ulcer than in other conditions, and seems to be a valuable sign. With the appearance of this point there is evidence from the *x-ray* stand-point that the pylorus has been pulled to the right.

¹ Mitt. a. d. Grenzgeb., 1914, xxvii, p. 479.

In pyloric ulcer, pain is complained of particularly on working, a symptom which deserves more attention. In cases with pain in the back adhesions with the pancreas have generally been found.

The distaste for meat, a symptom of cancer, urged by Boas, but to my mind of little value, was complained of in but two cases of carcinoma.

STATE OF HEALTH AT TIME OF EXAMINATION. In but one case of cancer was there cachexia, and only a few cases of cancer had pallor.

Palpation was seldom of much value, due either to the high position of the tumor or to the muscular rigidity. *x-ray* examination was always more reliable.

Gastric Chemistry. In carcinoma:

Total achylia	7 cases	50.0 per cent.
Subacidity	5 cases	35.7 per cent.
Normal acidity	1 case	7.1 per cent.
Hyperacidity	1 case	7.1 per cent.

In 85.7 per cent., there was deficient or absent hydrochloric acid.

In non-cancerous cases:

Anacidity	2 cases	8.0 per cent.
Subacidity	2 cases	8.0 per cent.
Normal acidity	6 cases	24.0 per cent.
Hyperacidity	14 cases	56.0 per cent.

Or, lowered acidity was seen in but 16 per cent.

Taking the non-cancerous cases by groups, we find duodenal ulcer (7 cases):

Normal acidity	3 cases
Hyperacidity	3 cases
Hypersecretion	1 case

Mixed ulcer (3 cases):

Normal acidity and secretion	1 case
Hyperacidity and hypersecretion	2 cases

Pyloric ulcer (6 cases):

Normal acidity and secretion	2 cases
Hyperacidity	4 cases

Hour-glass stomach (3 cases):

Subacidity	1 case
Hyperacidity	2 cases

Lactic Acid. This was found in 57 per cent. of the cancer cases, and in 8 per cent. of the non-malignant patients.

Blood, manifest or occult. The authors make the striking statement that in soft cancers bleeding is generally present, while in the schirrhus

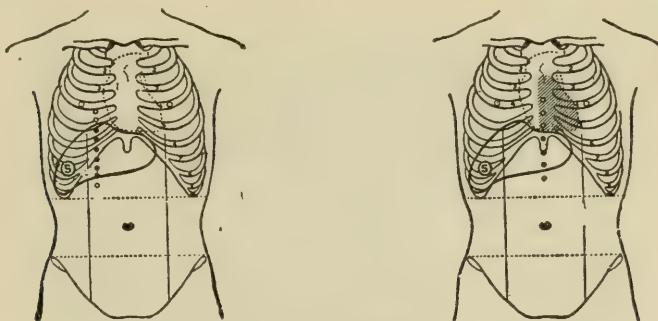
form the absence of occult blood has but little significance. In ulcer, much depends upon the time the examination is made. It is perfectly conceivable that certain ulcers may be undergoing processes of healing, and it is also apparent that at times ulcers bleed and at times they do not, and much, therefore, depends upon the time one elects to make the test. Never, in Schmieden's and his co-worker's experience, has occult blood been found when neither ulcer or cancer was present, which gives to a positive test great diagnostic value.

Motor Function. The information afforded by testing the motor activity of the stomach was in no sense conclusive.

X-rays. This is an invaluable aid in the diagnosis, as by its means one can always differentiate between ulcer and carcinoma.

Gastroscopy is too dangerous, and the risks one encounters in using the instrument far outweighs all advantages therefrom.

Examination of the Abdominal Viscera. Cantlie¹ made use of the tuning-fork and stethoscope in the examination of abdominal organs. The principle involved is, that when the stethoscope is placed over an organ, be it a solid organ, such as the liver or spleen, or a hollow organ, such as the stomach or cecum, and the vibrating tuning-fork is applied on the surface of the body over one or the other of these organs, the note of the tuning-fork manifests by its loudness the limit of the organ under examination, and the moment the limits are passed the note becomes faint, distant, or inaudible.



FIGS. 8 and 9

"The practical application of the tuning-fork-stethoscope method as applied, say to the liver, is as follows: Place the stethoscope (binaural) on the lower part of the right chest wall just above the lower right true rib cartilages, and about one inch behind a line drawn downward from the right nipple (Figs. 8 and 9). The tuning-fork is now made to travel from the region of the chest midway between the sternum and the nipple line, downward over the liver. The note heard when over the lung is faint and distant, but the moment it reaches the area of the liver the note is loudly

¹ British Medical Journal, 1914, I, p. 414.

heard, and, in turn, when the lower limit of the liver is reached, and the tuning-fork has other abdominal organs beneath it, the sound suddenly fades away to a faintly distant hum. The degree of pressure necessarily varies. Over the chest, the end of the fork has only to be gently held against the skin, but when a careful examination has to be made to gauge

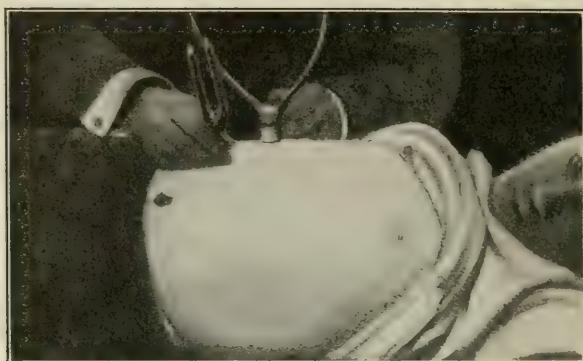


FIG. 10

the lower limit of the lower edge of the liver, as in stout people, or in cases of distention from gas in the intestine or fluid in the peritoneal cavity, the fork has to be pressed fairly deeply at times, so that the piece of intestine may be pushed aside or the fluid between the abdominal wall and the liver displaced." (Figs. 10 and 11.)



FIG. 11

Great accuracy is claimed for this method, especially in hepatic and splenic enlargements.

Sources of Error in the Use of the Stomach-tube. Harmer and Dodd¹ have shown conclusively in certain cases that the stomach-tube at times is not able to reach the gastric contents, and, as a result, false deductions are

¹ Arch. of Int. Med., 1913, xii, p. 488.

obtained. Fig. 12 shows diagrammatically the course of a tube in a patient, *x*-ray pictures of whose stomach are shown in the article. As the tip of the tube emerged from the esophagus into the stomach, it was seen to curve to the left when it became impinged against the stomach wall. Upon the passage of more tube, the tip remained stationary, an

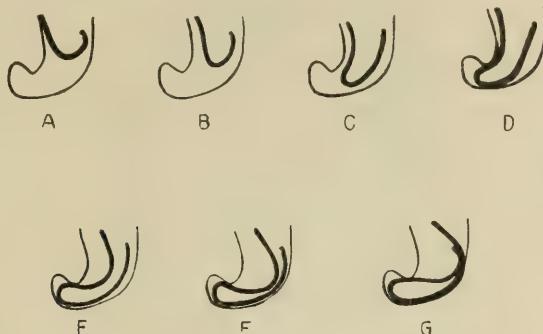


FIG. 12

inch above the level of the food in the stomach, and a dependent loop had formed. Upon the passage of thirty-nine inches of tube, the loop increased in size and advanced into the pyloric end of the stomach, where, owing to the narrowness of this part of the stomach, the loop became sharper.

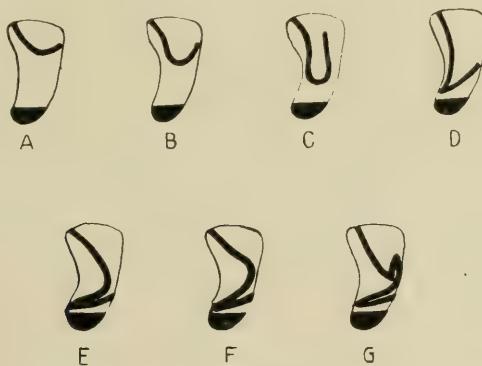


FIG. 13

Fig. 13 is a diagram of a case where a similar condition existed, but, as more tube was passed, the tip slipped from its position and came to lie at a higher level of the cardia and kinks were formed.

The authors believe this deflection of the tube is due to the fact that they are usually kept coiled before using and thus they acquire a tendency to curve. They recommend the use of a flexible rather than a stiff tube.

To overcome the objection raised by Harmer and Dodd, Rehfuss¹ has devised a modified stomach-tube on the principle of the duodenal tube, provided with a special tip, which, by its own weight, would seek the dependent part of the stomach (Fig. 14).



FIG. 14.—Modified gastric tube.

DRY TEST MEAL. Van Spanje² claims that the giving of triscuit has an advantage over "wet" meals, as the exact amount of gastric juice may be determined, because no liquids are given with it.

Examination of the Empty Stomach. In a series of healthy individuals none of whom were suffering with gastro-intestinal disturbances, varying amounts of acid contents were extracted (Rehfuss, Bergeim, and Hawk).³ In some cases over 100 c.c. were obtained, and in none was there less than 20 c.c. This last-named amount is generally accepted as being the normal quantity, but the fact that in a series of presumably healthy men (medical students) one should find none from whom less than 20 c.c. of residue could be obtained, leads one to question the accuracy of his former beliefs.

Methods for Testing for Hydrochloric Acid without using the stomach-tube recur from year to year without making much impression on medical thought, unless the endeavor to be more ingenious than one's predecessor, can be considered as evidence of an impression. Friedrich's "gastrognost" was the featured method last year, while this year, Schwartz,⁴ who tried the gastrognost on himself, and found that upon withdrawal, the bullet affair stuck in his throat, advances an easier and less terrifying method. He uses a Congo-dyed string enclosed in a readily soluble gelatin capsule, which, after digestion of the latter, may be withdrawn and examined. He calls it "the acido-test capsule." It is made by soaking a thread, 120 cm. long, in a 0.25 per cent. watery Congo solution for a half-hour, then

¹ Amer. Jour. Med. Sciences, June, 1914.

² Abstract Journal American Association, 1913, lxi, p. 1006.

³ Journal American Medical Association, 1914, lxiii, p. 11.

⁴ Deut. med. Woch., 1914, p. 20.

washing it in water and drying it at room temperature. The thread is run through the capsule and the whole swallowed. At the end of a half-hour, the capsule being dissolved, the thread is withdrawn and examined for color changes. If a blue black there is a high grade of acidity; if blue violet, moderate degree; if violet, low valued; and if red, there is no free acid. I fail to see why a Congo string cannot be used by itself, and can not understand why all the elaborate preparation of a gelatin capsule is necessary.

Hyperacidity. A few years ago one did not hesitate to diagnose the majority of the cases of hyperacidity as cases of pure gastric neuroses, provided that no gross lesion of the stomach presented itself. Following the work of Mayo and Moynihan on duodenal ulcer, internists became cautious in the use of the term, and began to seek organic factors to explain the hyperacidity. Schmidt¹ deals with some of these etiologic factors, but, strange to say, fails to mention appendicitis as a cause when there are gastric symptoms associated with a chronically inflamed appendix. A test meal in such condition will usually show hyperacidity to be present. This is not always the case, however, as this year I saw, with a surgeon, a young woman, aged twenty years, who had had signs of previous attacks of appendicitis, but whose chief symptom was indigestion, *i. e.*, symptoms of hyperacidity. To our great surprise, the total acidity was but 8, and there was no free hydrochloric acid.

It may be that Schmidt is in doubt as to the relationship existing between hyperacidity and chronic appendicitis. So was Solieri,² who had performed, without benefit to the patient, a gastro-enterostomy for persistent hyperchlorhydria with pylorospasm. For a year following the operation the patient had a continuance of his symptoms. A sudden attack of appendicitis with peritonitis demanded immediate operation (appendectomy and drainage) which was followed by immediate improvement with cessation of all gastric symptoms. This experience has been productive of an enthusiastic article by Solieri, subscribing, with apologies for his former scepticism, to Moynihan's teaching of a "dyspepsia appendicitica."

TREATMENT OF HYPERCHLORHYDRIA. Of the dietetic treatment, Schmidt³ has this to say:

"1. All food must be well cooked and most carefully minced. This order is based on my own theory that the chief business of the stomach is to reduce the food into small pieces, not by its muscular force, but by chemical influences. These influences consist in the dissolution of the intermediate substances, the connective tissue of meat and fat, the gluten of the bread, and the so-called "middle lamina" of the vegetables. As to the connective tissue, I have shown that only the gastric juice is able to digest raw or insufficiently cooked connective tissue, and that during the

¹ Journal American Medical Association, 1914, lxii, p. 430.

² Mitt. a. d. Grenzgeb., 1913, xxvi, p. 806.

³ Loc. cit.

digestion of meat in the stomach it is always connective tissue which is first dissolved, so that the muscular fibers are set free. This phenomenon is the base of the connective-tissue proof, which is a part of my test diet.

"As to the disintegration of bread in an efficacious gastric juice and its remaining compact in achylia or hyperacidity, it is sufficient to mention the phenomenon which is generally known as amyloorrhelia. The middle lamina of the vegetables is not really dissolved by the stomach juice, but is only prepared by it for dissolution in the alkaline intestinal juice. In this way the chemical stomach work leads to the reduction of all sorts of food into small pieces, and this is a much more significant act of the organ than solution of albuminous matter, as the latter is more surely and with more power affected by pancreatic juice. As the food pieces are broken up by the chemical influence of the gastric juice, they are pushed into the duodenum. Pieces not quite broken up remain for a long time in the stomach, while fluids are rapidly pushed forward. This process is also of importance for the evacuation of the stomach.

"2. The stomach must come to rest at least once during the twenty-four hours. This can best be arranged by changing the usual time of meals. The patients should eat large quantities of food in the morning, but only a small quantity in the evening. This means that during the forenoon, when, according to my experience, the patients suffer the least from their pains, they should take two or three meals with intervals of two hours so that there is little appetite left for lunch. After lunch they do not take anything until 7 P.M., when only porridge is given. They will now fast until the next morning, and this change also has the advantage that the production of gastric acid, which has been adapted before to lunch and dinner, is regulated in a new manner; the chief secretory reflexes, easily provoked during the former style of living, are now put out of circuit. I can say certainly that I have obtained very good results with this method.

"3. Drinking should be generally diminished and restricted to those hours when the stomach is not filled with food. I therefore give the meals rather dry, except the first breakfast and the evening soup, and let the patients drink a short time before lunch or in the afternoon. This prevents loading the stomach, which measure is of special importance to patients suffering from atonic ptosis."

Schmidt recommends, in severe cases, especially if there is gastroptosis, a rest in bed for two or three weeks, with the use of hot compresses twice daily, for two hours. Lavage is only indicated when the hyperacidity is associated with catarrh, and he rinses the empty stomach in the morning with 1 to 1000 salicylic acid or 1 to 5000 silver nitrate.

Administration of Bile in the Treatment of Hyperacidity. Based on the observation that the flow of bile may be increased by the administration of bile salts, and supposing that by this added amount of bile the duodenal contents can be made more quickly neutral, thus favoring the empty-

ing of the stomach, Palfrey¹ has administered bile salts to a large series of hyperacidity cases. A general diet was given merely to avoid unsuitable foods, and stress was laid upon not overeating and upon thorough mastication of the food. Ox bile was given in pills, each containing 0.25 gram of dried and pulverized ox bile, salol coated to conceal the taste and to prevent dissolution in the stomach. Two or three of these pills were given after meals three times a day for a week, after which, as a rule, the number was reduced. In practically all cases, the patients described improvement beginning within a few days, and at the end of a week or ten days gave a highly favorable report of their condition. Other papers reporting similar beneficial results are by Glaessner.²

HYPERCHLORHYDRIA AND HYPERTHYROIDISM. Marañon³ has found hyperchlorhydria to be the rule in the vagotonic form of hyperthyroidism. This he believes is due to stimulation of the pneumogastric nerve by the thyroid secretion. Atropin is most serviceable in such cases.

A diametrically opposite opinion is voiced by Müller.⁴ In twenty-four patients, he found achylia constant in all the cases of the pronounced, classic type of the disease, the achylia being marked from the beginning. On the other hand, when even one of the classic symptoms was lacking, the secretion of hydrochloric acid did not seem to be modified. Müller believes the evidence points to a chronic gastritis, being the underlying cause for the stomach symptoms rather than to a nervous achylia as supposed by Wolpe.

Pylorospasm. Holzknecht and Sgalitzer⁵ have made use of papaverin (an alkaloid of opium, but with only mild action) in diagnosing between motility anomalies seen in pylorospasm and pyloric stenosis. Their studies have been made by means of the *x*-rays especially, but also with test meals. Papaverin is said to bring about relaxation of smooth muscle fiber, and induces more rapid emptying of the stomach. In health, the length of time food remains in the stomach is lessened by one-quarter to one-third the normal period, in pylorospasm the pylorus becomes relaxed and the same is observed, while in stenosis there is no increased motility of the stomach but rather a delay. The drug, when given in doses of 0.05 to 0.07 grams, has no influence on peristalsis.

If the papaverin has such an action it will find a useful place in the treatment of pylorospasm attendant upon gastric ulcer, cholelithiasis, and many other conditions. The drug may be obtained from Merck as papaverinum hydrochloricum, and is given about an hour before meals.

Anacidity. Hirschberg⁶ recommends the giving of hydrochloric acid (dilute) in 40- and 50-drop doses before meals, claiming that the cus-

¹ American Journal Medical Sciences, 1913, cxlv, p. 796.

² Wien. kl. Woch., September 28, 1911; and Med. Klinik, February, 1914.

³ Rev. de Méd., 1914, p. 161.

⁴ Abstract Journal American Medical Association, 1914, lxii, p. 820.

⁵ Münch. med. Woch., 1913, p. 1989.

⁶ Berl. kl. Woch., 1913, p. 1889.

tomary dose of 10 to 15 drops is too small. He recommends it being given in raspberry vinegar or in sweetened water. I have seen good results follow the use of the acid when given in increasing amounts. One may begin with 15 drops three times a day and increase the daily total by three drops until 50 or 60 drops are being administered, depending on the symptoms. I have found it advisable to have the patients take the acid in a full glass of water through a glass tube with the meals, and to drink no other liquid with the meal. The acid water should be drunk as is any other water, a mouthful at a time. In this way it has always seemed that there is a more intimate mixing of the acid and the food.

Achyilia Gastrica. Albu¹ regards this disease as consisting of three sharply defined features: (1) disturbance of secretion; (2) disturbance of chymification; (3) disturbance of motility.

The disturbance of secretion is denoted by a marked diminution of the acid and ferment production, the disturbance of chymification by the failure of the test meal to be digested so that there are isolated crumbs of bread to be seen, and the disturbance of motility is shown by the exaggerated emptying power of the stomach so that it takes but half the length of time for the stomach to expel its contents. The typical appearance of the latter is a thick, tough, scarcely digested extractum and not the fluid anacid contents often seen.

Although Albu defines the features of achyilia so sharply, he states that the etiology is by means so clear cut. Etiologic factors are grouped according as they are primary or secondary. The *secondary* causes are senile atrophy of the gastric mucosa, chronic atrophic gastritis, gastric carcinoma (occurring in an early stage of this), pulmonary tuberculosis, chronic nephritis, diabetes, arteriosclerosis, cholelithiasis, pancreatic disease, colitis, and finally, Albu regards it as being at times a constitutional anomaly in the sense that visceroptosis is. The *primary* achylia are classified in two groups, the acquired and congenital, although it is difficult to see the grounds for this reasoning.

The treatment consists in giving the patients food in a mushy form, so as to imitate closely the gastric chymification. A vegetable diet is to be preferred, and it is recommended to exclude meat for a period of from four to six weeks. The meat-free diet is supposed to be of benefit because there are fewer putrefactive bodies when meat is not eaten. Yoghurt milk or some similar preparation is advised. Of medicines, hydrochloric acid 25 to 30 drops in a large glass of water, is of service, or the acidol and acidol pepsin tablets, of which mention was made in PROGRESSIVE MEDICINE two years ago.

Motility of the Stomach. Normally, the stomach is empty six to seven hours after a test dinner, and two hours after a test breakfast. If the stomach contains food at the end of seven hours, but is empty

¹ Therapie der Gegenwart, 1913, p. 433.

at the end of twelve hours, the condition is one of insufficiency of the *first degree*. If, after a meal given the night before, rests are found in the morning washing, one speaks of an insufficiency of the *second degree*. Winternitz,¹ devotes a lengthy article to the treatment of the disturbances of these two types of gastric motility.

DIETETIC TREATMENT. A diet must be so selected that all overloading of the stomach is avoided, and the motor function of the stomach has but few demands placed upon it. Regard must be paid to the secretory functions as well. Formerly a dry diet was recommended and then a fluid diet, and although Winternitz prefers the former, from practical considerations one is forced to what is termed soft diet, or semiliquid diet. The objections to the dry diet are, that it must be thoroughly chewed, and also that it is very difficult to have it prepared in a tasty manner. On the other hand, its great advantage is that the food may be given in smaller amounts, the diminished bulk making fewer demands on the stomach. The quality of the food depends upon the secretory conditions. With atony and benign pyloric stenosis there are generally hyperacidity and hypersecretion. Well-boiled beef, veal, and fowl are well borne, while fatty meats and fried foods are not well tolerated. Butter, cream, and eggs are digested easily, and olive oil is very useful. One must avoid fresh bread, using stale or dried bread in preference, and vegetables must be served in the form of puree. All highly seasoned or spiced foods are to be avoided.

When there is sub acidity, a semiliquid, carbohydrate-rich diet should be used; rice, barley, potato, cream soups, puree of vegetables, legumes, and puddings. Winternitz cautions us that no one scheme of diet will be applicable to every patient, but individual preferences and tolerances must be regarded. The main thing is to avoid overloading of the stomach. It is far better to eat every two to three hours than to eat a large meal three times a day, and the intake of water at each meal must not exceed 200 to 250 c.c. Milk, water, weak tea, or coffee may be used, but carbonated waters, mineral water, beer, and alcohol must be prohibited.

After eating, one should rest, lying on the right side in order to favor the emptying of the stomach. The use of abdominal support in the form of a binder or adhesive plaster and electrotherapeutics, gymnastics, and massage are all useful. As far as medication is concerned, when there is hyperacidity, alkalies should be used. Winternitz recommended ext. nux vomica 0.02, magnesia asta and bismuth salicylate à à 0.5, three times a day after meals. When there is sub acidity and fermentative changes, capsules of creosote (0.1) or resorcin (0.1) or hydrogen peroxid after meals.

If there is dilatation, methodical lavage is indicated, using warm

¹ Deut. med. Woch., 1914, p. 1007.

water, or water with salicylic acid or boric acid, 4 grams to the liter. Lavage is preferably performed a few hours after the evening meal in order to give the patient a comfortable night.

Only when there is definite organic pyloric stenosis, and the patient is unable on account of occupation to give himself the proper care, should an operation (pylorectomy) be considered.

CHLOROPHYL TEST. This test (Boas) has been studied by Kemmerling¹ and by Wartensleben.² It is interesting to compare the two articles, the first by a physician from Düsseldorf, and the second by a man working in Boas' laboratory. The tone of Kemmerling's article, while endorsing the method, and rating it as by far the best, gives one, nevertheless, the impression, that the author has approached his study with an impartial mind and with an eye keen to note discrepancies in as well as advantages of the method. He considers the test from these stand-points: Does the chlorophyl method give accurate and certain results? Does it express in mathematical terms great and small disturbances of gastric motility? Has the chlorophyl itself any action on the stomach? Is it a method which is applicable in practice? Is it a better method than all the others, and should it displace the customary tests?

His research shows that theoretically the test is accurate and also, in some cases, that practical results are obtainable, but that it has certain inherent sources of error which make it at times inaccurate. These sources of error Kemmerling describes as being (a) the danger of leaving some solution in the stomach; (b) the uncertainty of knowing how much gastric juice is in the recovered fluids; (c) the possibility of using too much water in washing out the stomach; and (d) certain accidental happenings, such as entrance of bile into the stomach, production of mucus and swallowing of saliva, all of which render the test more or less inaccurate. Compared with the Leube test and Röntgen-ray examination, the chlorophyl test gave accurate results in 62 per cent. of the cases, a sufficient indication that the method is of practical value provided the sources of error named above can be eliminated.

Wartensleben³ takes objection to some of Kemmerling's findings, but admits that the method is far from being an ideal one, and recognizes the need of certain modifications upon which he is now at work.

SAHLI'S TEST MEAL. Studies on gastric motility with Sahli's test meal have been made during the last seven years by Znojemsky⁴ in the surgical clinic in Prag. In all, about 700 cases have been examined and the results obtained are worthy of consideration.

1. Marked decrease of motility, secretion, and acidity, with the presence of lactic acid, indicate pyloric carcinoma.

¹ Boas' Arch., 1914, xx, p. 29.

² Loc. cit.

³ Ibid., p. 67.

⁴ Deut. Ztsch. f. Chir., 1913, cxxii, p. 393.

2. Normal motility, lessened secretion, and acidity with lactic acid speak for carcinoma ventriculi.
3. Lessened motility, somewhat diminished secretion, and acidity, with absence of lactic acid, point to carcinoma of the pylorus on the basis of an ulcer.
4. Normal motility and somewhat diminished secretion and acidity (negative lactic acid) indicate carcinoma ventriculi on the base of an ulcer.
5. Diminished motility, normal or diminished secretion, hyperacidity, speak for *ulcus pylori*.
6. Normal motility, normal or diminished secretion, hyperacidity, point to *ulcus ventriculi*.
7. Diminished motility, normal secretion, normal acidity speak for *gastrophtosis*.
8. Normal or decreased motility, hypersecretion, almost normal acidity, indicate *ulcus duodeni* or *ulcus pylori*.
9. Diminished motility, secretion and acidity are found in *chololithiasis* and *ven. mobilis*.
10. Variations in secretion and acidity (sometimes high, sometimes low) speak for *pylorospasm*.

The method of Sahli is warmly recommended by Znojemsky.

Lavage of the Stomach. In the *Deutsche medizinische Wochenschrift*, 1913, p. 2129, Boas contributes an interesting essay on the changes in the indications for gastric lavage since Kussmaul introduced the stomach-tube in 1869. The paper does not lend itself to a review, but traces the development of our present-day view of the importance of lavage. Briefly put, the only indications which Boas recognizes are those conditions which induce stagnation in the stomach by preventing the exit of food.

LAVAGE WITH ICHTHYOL. The toxic coefficient of gastric juice before and after using ichthylol (1 to 1000) as a lavage fluid, forms the basis of an article by Conti.¹ It is an article which begins modestly enough to be sure, but a footnote on the first page makes one pause a moment for reflexion. The author says he has awaited the result of the animal experimentation before publishing his clinical cases, and "today I am happy to contribute my modest report to the therapeutics of gastric diseases;" and the footnote reads, "By today is meant 1910; as a result of unavoidable occurrences this work sees the light of the world first in 1912." (This number of *Boas' Archives* appeared in 1913.) The poetical apologetic tone is a little strange in such surroundings but quickly changes to a firmer and more assertive note later on (p. 554), where he says by means of the ichthylol lavage, "I have been able in a comparatively short time to bring about cure of abscesses and ulcers of the stomach." We learn that the

¹ Arch. f. Verdkr., 1913, xix, p. 549.

astounding result is brought about by introducing a stomach-tube through which the ichthyl solution is poured. "Of course the tube is left in the stomach while the ichthyl is there (fifteen minutes being the average time), as withdrawal of the tube causes vomiting, *perhaps*" (the italics are mine) "on account of the taste of the ichthyl." Conti has no fear of cases of gastric hemorrhage! The tube goes down notwithstanding, and through it the ichthyl and a 1 to 1000 adrenalin solution (!). Cancer is materially benefited. The cachexia disappears and, by the way, the author states profoundly "An experience of many years has taught me, that the more a carcinoma patient lives under good external conditions, but especially internal hygienic conditions, the less likely will the cachectic appearance be seen."

Perhaps timidity may be at times a virtue and not a fault, and I should advise those who have scanned Conti's article seriously to read the paper again before following his line of treatment.



FIG. 15



FIG. 16

Vagotonia. An attempt is made by Klee¹ to study the effect of increased vagus and sympathetic tonus on the shape and movement of the cat's stomach. By using Sherrington's method of decerebration, and then cooling or warming the vagus he achieved increased sympathetic tone or vagus tone at will. Figs. 15 and 16 are representations of the normal stomach and of a stomach severed from its nerve connection. There is no essential difference except that the "denerved" stomach seems to be wider in its pars media and more relaxed throughout its whole extent. Its tone is less, although the peristaltic folds are no less well marked, although its nerve supply is destroyed with the exception of the plexus of Auerbach. Figs. 17 and 18 show the effect of cooling the vagus, which has the effect of lowering its tone and bringing to the fore the sympathetic tonus. It will be seen that there is an absence of peristaltic waves, the pars pylorica

¹ Münch. med. Woch., 1914, p. 1044.

is broadened and its transition into the pars media and fundus is not differentiated. The stomach itself feels soft. When the vagus is warmed, restoring its tone, the change in shape is striking (Figs. 19 and 20). The pars pylorica becomes narrowed, peristaltic depre-



FIG. 17



FIG. 18

sions are seen which gradually become deeper, and the fundus becomes more rounded. There are marked contractions of the pars pylorica and pars media reaching as far as the fundus, and with this there is a rapid and forceful emptying of the contents into the duodenum, and a rapid expulsion from this part of the small intestine.



FIG. 19



FIG. 20

The author wisely refrains from applying his results to man, although his cuts remind one forcibly of a typical picture of vagotonia described by other writers. With the impulse started by Eppinger and Hess, the importance of vagotonia in its relations to abdominal disease seems to be one that should be recognized.

This has been done by Thies¹ in a study of biliary disease. He has taken as the characteristic symptoms of gall-bladder disease, constipation, diarrhea, vomiting, dry mouth, salivation, increased frequency of urination, palpitation, itchy skin, cough, dyspnea, asthma, cold feet and hands, perspiration, and has studied each and all in thirty cases of gall-bladder trouble. His results I have arranged in a tabular form.

Constipation	86.6 per cent.
Cold hands and feet	83.3 per cent.
Vomiting	80.0 per cent.
Palpitation	73.3 per cent.
Itchiness	66.6 per cent.
Increase of urination	56.6 per cent.
Respiratory distress	53.3 per cent.
Respiration	33.3 per cent.
Diarrhea	20.0 per cent.
Dryness of mouth or salivation	20.0 per cent.

These symptoms Thies believes are directly referable to stimulation of the vegetative nervous system, and he expresses the opinion that similar studies with other abdominal disorders will furnish one with a symptomatology so exact that abdominal diagnosis will be materially benefited.

Atropin in Gastric Disease. It sounds rather startling to read in an article by Pletnew² that atropin is used but little in the clinic. This may be the case in Moskow, where the author is engaged as the director of a medical clinic, but it is certainly not correct so far as this country is concerned. If the indications for its use are based on the author's diagnoses, there seems to be room for criticism. Thus we note "neurasthenia, catarrhus ventriculi, hyperchlorhydria, colitis," "neurasthenia, gastritis chron., hypersecretio, hyperaciditas (hyperchlorhydria), pylorospasmus, insufficienta motoria levis, kolitis," "neurasthenia, hypersecretion, hyperaciditas (hyperchlorhydria), ulcer ventriculi." There seems to be still a tendency in Russian medicine to diagnose by symptoms instead of recognizing the underlying cause. Thus in the third diagnosis quoted above, "ulcus ventriculi" alone seems to be adequate. One sees no end in sight if this symptomatological diagnosis is practiced, for might we not add to the above, anemia, dolor, hemorrhagia, hemorrhagia occulta, etc.?

Acute Dilatation of the Stomach. A truly remarkable case of this serious condition was observed by Richardson.³ It seems that during an operation for ruptured duodenal ulcer, the stomach dilated before the surgeon's eyes, and the description of the phenomenon is

¹ Mitt. a. d. Grenzgeb. d. Med. and Chir., 1914, xxvii, p. 389.

² Therap. Monatshefte., January, 1914, p. 30.

³ Brit. Med. Jour., 1913, ii, p. 1202.

best given in his own words: "I sutured the abdominal wall with a first layer of continuous catgut, and had sewed up about two-thirds of the peritoneal wound, when I noticed that the upper part of the stomach was distending. In less than half a minute, the stomach was bulging into the lower part of the wound and the distention increased so rapidly that the suture had to be unlaced. The stomach dilated more and more until it became drum-like and very tense. It appeared to be anchored at the pylorus and the cardiac extremities, because, as the distention increased, it rolled upward, bringing the greater curvature forward. The veins on the stomach became very prominent and large. I did not see any distention of the duodenum, and the lower part of the abdomen did not increase in size. A stomach-tube, was passed by the mouth, and immediately there was a rush of gas through the tube and the distention disappeared. The stomach then became firmly contracted and not greater in diameter than a piece of large intestine. The muscular contraction was extreme, and there was no peristaltic wave. It contracted in sections, there being alternating white rings, and intervening portions were naturally colored. The venous engorgement also disappeared entirely. At the same time the respiration became quiet and wholly thoracic, the complexion became pink, the pupils contracted, and the whole aspect of the patient changed. Less than five minutes relapsed between the beginning of the distention and recovery. The patient did well and has not differed in his after-progress from other cases of ruptured duodenal ulcer."

Gastric Tetany. The occurrence of tetany in cases of chronic dilatation of the stomach was first discussed by Kussmaul in 1869. The most prominent feature of the disease is the tonic spasm of the muscles of the upper and lower limbs, with, at times, clonic spasm of the muscles of the jaw, neck, and back. The attacks last from a few minutes to half an hour, and disappeared as suddenly as they appeared, but during their continuance the patient is unable to open his mouth, and, in some cases, opisthotonus is a prominent symptom.

"In other cases, the tetany is followed by convulsions that closely resemble epilepsy, the fits are usually repeated in rapid succession. In typical cases, the wrists and elbows are partially flexed, and the forearm strongly pronated; the fingers are bent over the thumbs, flexion being most marked at the carpophalangeal joints, the palms are hollowed by the approximation of the thenar and hypothenar eminences, and therefore the hand becomes cone-shaped (the accoucheur's hand). In the lower extremities the legs are rigidly extended, the heels drawn up, the soles of the feet turned inward, and the toes are bent downward and adducted. The patient often complains of pain while the spasm lasts, and the affected parts are blue and cold. The deep reflexes are much increased, the superficial reflexes may

also be exaggerated, and the muscles react very readily to the interrupted current. The patient generally remains quite conscious during an attack. The breathing is quickened, the pulse full and regular. The temperature is at first often depressed, but in fatal cases it often rises to 108° F. before death. The pupils are often contracted, but react both to light and to accommodation. Cutaneous sensibility rarely undergoes any decided alteration, but in two or three of the recorded cases, hyperesthesia was observed. Retention of urine usually occurs, and the urine often contains a small quantity of albumin. Occasionally a trace of sugar or acetone is present. Delirium, rise of temperature, excess of albumin in the urine, coma, with dilatation of the pupils, and the presence of tetanic or epileptiform seizures are all signs. In almost every case the first attack is soon followed by others. The duration of the spasm may be from four or five minutes to several hours, but it may remain almost constant for two or three days. It often follows an attack of vomiting or diarrhea, and a spasm may sometimes be induced by percussing the epigastrium, by passage of a stomach-tube, or by pressure on the main artery of a limb. Sometimes patients have premonitory symptoms, such as tingling and creeping sensations along the arms and down to the finger tips, associated with headache and often a feeling of nausea."¹

The etiology of this obscure disease is unknown, and various theories have been advanced, notably excessive loss of water produced by the vomiting, and hyperchlorhydria. According to Irwin, the most probable cause is the absorption of some poison produced in the dilated stomach by bacteria. This poison is frequently present in the stomach of persons with pyloric or duodenal obstruction, but its absorption is prevented by the integrity of the columnar epithelium. Irwin believes that when this natural barrier is injured, or partly removed by the employment of a tube, or by a very severe attack of retching, the convulsive agent is enabled to gain immediate access to the circulation and to exercise its toxic effects upon the central nervous system. The thyroid and parathyroids are assumed to protect cases of gastric toxemia from tetany, this assumption being supported by the fact that tetany frequently follows removal of the thyroids and parathyroids, and also by the frequent association of gastric toxemia with an enlargement of the thyroid.

The disease is a serious one and treatment seems to be strangely ineffective, as, out of thirty-nine cases collected by Irwin, only eleven recovered. "Every drug, from calomel to the latest antiseptic, has been tried, but the only hopeful treatment consists in operation."

Aerophagy. The spasmodic swallowing of air followed by eructations is what is held by Aaron² to indicate the condition known as

¹ Irwin, British Medical Journal, 1913, ii, p. 1200.

² Journal American Medical Association, 1914, lxii, p. 2012.

aerophagy. It is seldom found by itself but always indicates organic or functional affections of the digestive tract. The eructations may begin at any moment and may continue for several minutes or hours. "At first the belching is slow and practically noiseless, but it soon becomes more rapid and loud, so that not only the patient, but the whole household, is disturbed. By close observation, the physician will notice that the patient collects a little saliva in the mouth, slightly flexes the head on the thorax, closes the mouth and swallows. By this procedure the air is forced into the esophagus, producing a sound which leads the patient to believe that the act is an eructation, while just the opposite is the case. On opening the mouth, the air is noisily belched, and then swallowing and eructation follow closely on each other almost continuously. At times it requires eight or ten swallowings of air to induce one good eructation."

Aaron believes that bile in the gastric contents with eructation is a pathognomonic sign of aerophagy, and he depends on this for an absolute diagnosis. The treatment consists in making the patient belch with his mouth open, informing him as to the true nature of his trouble. Hyperalimentation, sounds introduced into the esophagus, electricity, hydrotherapeutics, and antispasmodics are all useful.

RECTAL AEROPHAGY. This curious name has been used by Taillens¹ to denote a condition of intestinal flatulence caused by aspiration of air per rectum. The patient was a young girl, accustomed to assume a Trendelenburg position, whose trouble, Taillens believes, is ascribable to the anatomical changes taking place while the patient was in this posture.

Tuberculosis of the Stomach. Tuberculosis of the stomach is generally divided into four groups:

1. The ulcerative form.
2. The hypertrophic form leading to tumor formation.
3. The fibrotic form with sclerosis of the stomach, especially of the submucosa.
4. Perigastric adenopathy with perigastric adhesions.

These four groups are not always distinctive, as ulcers often show sclerotic changes in the neighborhood of the ulcer, and the hypertrophic form may be associated with ulcer formation.

Ortali² describes a tuberculous tumor in a farmer, aged fifty-two years, who had had stomach trouble for six months; eructations, pain an hour or two after eating, and vomiting every two or three days soon after eating. No blood had been noticed in the stools or vomit. There was slight evening temperature, no cough or night sweats, but diarrhea and constipation alternated, and the man grew very thin. Lactic acid, but no free acid, was found in the stomach contents and

¹ Arch. des Mal. de l'App. Dig., 1914, p. 43.

² Abstract Journal American Medical Association, 1913, lxi, p. 1855.

the stomach was opened on suspicion of cancer. The pyloric region was found to be the seat of a hard tumor studded with granulations. Gastro-enterostomy relieved the patient of his gastric disturbances, but he succumbed two months to peritonitis.

The diagnosis of a tuberculous gastric condition is a matter of no little difficulty, the symptoms being essentially those of cancer.¹ Of great assistance in the diagnosis may be the finding of tuberculosis elsewhere, notably in the lungs. In Schlesinger's case, there was an abscess in the mucosa and he believes this should be placed as a fifth variety of tuberculosis of the stomach.

Gossmann² has devoted a lengthy paper to the consideration of tuberculous gastric ulcer. His material was selected from the sections made in Munich between the years 1900 and 1912, during which time 5900 sections were made. Of these autopsies, 2360 cases, or 40 per cent., showing evidences of tuberculosis, 18 cases exhibited tuberculous ulcer of the stomach. Of all autopsies, ulcer (tuberculous) was seen in 0.31 per cent. Of cases of tuberculosis, it was seen in 0.76 per cent., figures which show conclusively that tuberculous ulceration must be a very rare condition, a conclusion in harmony with the experience of other writers:

Glaubitt	. . . . .	{ 0.4 per cent. of all autopsies. 2.1 per cent. of all tuberculous cases
Plambeck	. . . . .	0.6 per cent. of tuberculous cases
Simmonds	. . . . .	0.4 per cent. of all cases.

Polyp of the Stomach. A patient reported by Ledderhose³ was operated upon for a condition which, clinically and from the stand-point of the *x*-rays, bespoke cancer. At operation a small cherry-sized polyp arising from the anterior wall of the stomach was removed, since which time the patient has been perfectly well. Although the author advises one to have in mind a polyp when clinical signs point to carcinoma, there was no feature in this patient's case which is not to be found in cancer, and it would be difficult to make a differential diagnosis. Ledderhose claims polyps are prone to malignant degeneration, but Meulengracht⁴ says it has been observed in only four of the twenty-four cases on record of polypous gastritis.

Hair Balls. The unusual coincidence of a hair ball in the stomach and in the intestine has led Heazlit to report his case.⁵ The patient was a girl, aged thirteen years, who had been putting her hair into her mouth and swallowing it since she was five years old. She was seized suddenly with stomach-ache, vomiting, and abdominal pain,

¹ Schlesinger, Münch. med. Woch., 1914, p. 987.

² Mitt. a. d. Grenzgeb., 1913, xxvi, p. 771. ³ Deut. med. Woch., 1914, p. 2349.

⁴ Abstracts Journal American Medical Association, 1913, lxi, p. 2026.

⁵ Ibid., 1914, lxii, p. 107.

and, later, a large sausage-shaped tumor was seen occupying the area between the ensiform cartilage and the umbilicus. Vomiting of hair particles furnished the clue to the diagnosis. At operation, a hair tumor which completely filled the cavity of the stomach was found. It weighed fifteen ounces, and measured seven and three-quarter inches in length, two and a half inches in diameter, and seven inches in circumference. A review of the literature makes the article a complete study of the subject.

Another case occurring during the year is reported by Moore.¹

X-rays and Tabetic Crises. V. Czyhlarz and Selka² had the unique opportunity to view the stomach during a tabetic crisis.

There was no attempt at vomiting, and the stomach seemed apparently normal. The emptying time of the stomach was in nowise delayed.

This is a very important observation, inasmuch as in a tabetic patient one assumes that all gastric symptoms are those of a more or less typical crisis. During the past year I had a patient under my care who confessed to syphilis, who had a positive Wassermann reaction, with pupillary changes, and who, furthermore, had severe pains in the stomach. These I believed to be in part caused by tabes and in part by an old ulcer. Clinical signs and *x-ray* examinations all supported this opinion, but in view of the definite signs of tabes, the surgeon declined to operate, claiming that the symptomatology, etc., were due to syphilis, and that there was no ulcer.

If it is true that there is no change in the stomach during or between crises, much will have been gained, as it is entirely conceivable that ulcer and tabetic crises may be existent in one and the same individual.

Gastric Crises not due to Tabes. Leriche³ directs attention to causes of typical gastric crises other than tabes. Generally in these cases, operation will reveal pancreatic lesion, indurated penetrating ulcers of the stomach or carcinomatous adenopathy involving the solar plexus. He urges recognition of these causes and describes good results following judicious use of operative procedures.

Abderhalden's Test in the Diagnosis of Gastro-intestinal Diseases. The theory of "Abwehrfermente" has been used by Kabanow⁴ as a practical means of diagnosing certain lesions of the gastro-intestinal tract. Although the article is essentially a preliminary report, his results seem to indicate that isolated diseases of the stomach or intestine are accompanied by certain ferments in the blood-serum which seem to be in the nature of *abwehrfermente*. Should later work along these lines fulfil the promise suggested by Kabanow's researches, the

¹ Boston Medical and Surgical Journal, 1914, clxx, p. 8.

² Wien. kl. Woch., 1913, p. 842.

³ Lyon Chir., February, 1914, p. 169.

⁴ Münch med. Woch., 1913, p. 2164.

future diagnosis of gastro-intestinal diseases seems to be destined to be made in the laboratory, and the scope of the diagnostician's activities will be limited to the interpretation of test-tube reactions.

DISEASES OF THE INTESTINE.

Small Intestine. DUODENAL ULCER. *Diagnosis.* The keynote of progressive German views regarding duodenal ulcer, a disease, which thanks to Moynihan and others, has received much recognition in America and England, and but little consideration in Germany, is struck by Kümmell.¹ "It is not the first time that a well-recognized symptomatology has stepped suddenly from oblivion, and aroused the interest of medical science to a high pitch. Has duodenal ulcer of itself, or in comparison with gastric ulcer, increased so rapidly in frequency, or do we meet with it more often since we have devoted our clinical interest to its differentiation and diagnostication? I believe the latter to be the case. The number can hardly have increased; it formerly was present as frequently as now, but it had not received consideration and was not recognized. When operated upon, it was called *uleus pylori*, even when the ulcer was in the duodenum. Certain gastric disturbances which we were content to call hypersecretion or hyperacidity we now seek to refer to a somatic cause or to a duodenal ulcer."

Two years ago, Kümmell wrote that it was very difficult to distinguish between duodenal and gastric ulcer, but since then the number of cases operated upon has increased materially, due to increased diagnostic acumen. The following will speak for itself:

	Gastric ulcer.	Duodenal ulcer.
No. of cases up to end of 1910	184	11
No. of cases in 1911	7	4
No. of cases in 1912	10	7
No. of cases in 1913 and 1914	11	42

As far as the symptomatology is concerned, Kümmell agrees with Moynihan more and more that "History is everything, physical examination nothing," and, of the symptoms, he lays great stress on hunger pain, periodicity of the pain, and long duration of the illness. Of the objective signs, pain to the right of the median line is the most valuable. Occult blood, when present, speaks for duodenal ulcer, and when absent does not speak against its existence, and the same holds for hyperacidity, namely, that the latter speaks for ulcer while normal values do not militate against such a diagnosis. Hypersecretion is a very valuable sign. The x-ray features which I shall discuss later, are of paramount value. Kümmell believes then, that the diagnosis is

¹ Deut. med. Woch., 1914, p. 1161.

justified when there is (a) long duration of illness, (b) hunger pain, (c) periodicity of symptoms, (d) right-sided tender point, (e) occult blood, (f) hyperchlorhydria and hypersecretion, (g) *x*-ray findings.

Ewald¹ claims he cannot diagnose duodenal ulcer any more frequently now than he could three years ago, and he says nothing remains but to assume that in other lands, diagnoses are wrongly made or are made on insufficient evidence, or perhaps the German conception of the disease is too rigid. He disagrees with Moynihan's dictum about the anamnesis being everything, and says the wish is often father to the thought in many cases. Ewald thinks hunger pain and periodicity of the symptoms unreliable evidence, in fact, history without examination is absolutely useless. Occult blood in the stools he holds to be a valuable sign, especially if it is absent from the gastric contents. Of the greatest value is the *x*-ray examination, which often gives the most trustworthy information.

Bier² seems more and more inclined to accept Moynihan's views, although in a paper devoted to a study of Moynihan's symptom-complex, he finds certain symptoms to be inconstant, notably hunger pain and periodicity of the symptoms. The objective sign of a tender point to the right of the midline he believes not to be characteristic, and although the *x*-rays are of great assistance, he is far from being certain that it is an infallible indication of ulcer.

Kemp³ shows distinctly the German influence. He says, "that with all due credit to the writers who have turned the lime-light of attention on duodenal ulcer, their work must be considered as a step backward rather than forward, for time has shown," he insists, "that the syndrome they have emphasized does not belong to duodenal ulcer but to juxta pyloric ulcer, regardless of whether the ulceration extends down into the duodenum or up into the stomach. Periodicity of the disturbance is not peculiar to duodenal or juxta pyloric ulcers but is observed with other stomach affections at times, intervals occurring in which all the symptoms may disappear. Tardy pain may occur with affections other than ulcer. There is danger that the subjective symptoms may be given too much weight in diagnosis and that the physician's mode of questioning may suggest to the patient the answers that are anticipated, especially in regard to the subjective symptoms, and among these, the tardy pain in particular. Previous examinations by other physicians or the conversation of other patients may afford suggestions that will unconsciously modify the patient's statements as to the previous status and history of his case."

One may say, with all due credit to earnest men like Kemp and others of his belief, *their* work must be considered as a step backward rather than forward. There is a medical adage which runs something

¹ Berl. kl. Woch., 1913, p. 1789.

² Deut. med. Woch., 1913, p. 2492.

³ Abstract Journal American Medical Association, 1913, lxi, p. 1500.

like this: "Never be the first to accept a new belief nor the last to abandon an old one," and it seems unwise to refuse to credit the work of Moynihan, Mayo, and a host of others who have shown conclusively the existence of a duodenal ulcer, and who have described accurately its symptomatology.

A reflection on the reluctance of German physicians to recognize the existence of duodenal ulcer is made by de Koch,¹ a Hollander. He takes no pains to disguise his annoyance at the Dutch medical profession, who seem also to doubt the disease. "The rarity of cases of perforated duodenal ulcer in the Netherlands" (he intends to say, no doubt, "the rarity of *diagnosed* cases of perforated duodenal ulcer") "is due to the general ignorance of the existence of the chronic duodenal ulcer. No diagnosis of it is made. The Netherlands medical profession is still influenced by the German conception that the accompanying hyperacidity and other symptoms are due to a nervous affection of the stomach, and that there is no need to seek for an organic lesion." The Americans and the English, he states, have been pioneers in the recognition of ulceration of the duodenum, and de Koch hopes that their views may be speedily accepted in his country and that the profession will not wait until the proper appreciation of duodenal ulcer has had to filter to them through German channels first.

Occult Blood in Duodenal Ulcer. In determining the significance of occult blood in duodenal ulcer (positive results being claimed by various writers in 50 to 100 per cent. of the cases), one must have in mind that there may be three stages of ulceration (*a*) the florid, (*b*) the incompletely cicatrized, (*c*) and the completely cicatrized ulcer. It may positively be stated that when the ulcer is of the florid variety, occult blood is always present, and when none is found and clinically there are signs of ulcer, the latter must be present as scar tissue or in the form of one or more complications (adhesions, perigastritis, hyperacidity, *ulcus penetrans* or *callosum*, hour-glass stomach, pyloric synechiae). Blood which comes from a fresh ulcer must always be found in the stools, provided there is no mechanical obstruction preventing its egress. Such is the dictum of Boas,² to which I can heartily ascribe.

Boas believes the wide variation in positive findings (50 to 100 per cent.) lies in the technique of the examination. The guaiac test is serviceable only for rather larger bleedings, and Boas now discredits the benzidin test as not being delicate enough, a statement, I fear, which will not be generally accepted. He advocates his phenolphthalein test, which he claims detects blood in dilutions of 1 to 8,000,000 (one ounce of blood taken by mouth was readily detected in the stools).

¹ Abstract Journal American Medical Association, 1913, lxi, p. 1418.

² Deut. med. Woch., 1914, p. 1152.

Hallez¹ has made comparative tests with all methods, and believes chemical reactions, strictly speaking, are preferable to all others. He advises the use of the guaiac method first, and if this gives negative results, one should resort to the benzidin test. Hemospectroscopic tests are not delicate enough and are too cumbersome.

Thread Tests. Einhorn has suggested the use of a thread of No. 5 silk, 75 cm. in length, in the diagnosis of bleeding in the upper part of the gastro-intestinal tract. The thread is fastened to the duodenal bucket, and after remaining in the stomach all night is withdrawn, and the appearance of brown or black discoloration noted. If the stain appears 40 cm. from the lips, the ulcer is on the cardia, of 44 to 54 cm. and over in the duodenum. The size of the ulcer is also ascertained by measuring the extent of the discoloration.

This test, although four years old, has been made the subject of study by Wilenko.² He believes it to be an extremely valuable one, and that it far excels the stool examination. Especially as a criterion of cure is it of worth, as Wilenko has found stains on the thread from eight to ten weeks after cure was pronounced, and when the patient was free of symptoms and the stools negative for occult blood.

He believes by carefully performing the test one will be much more cautious about allowing patients to resume a full diet, for not until repeated negative findings can one be sure that a final healing of the ulcer has been effected.

Radiologic Signs of Duodenal Ulcer.³ (a) *Hyperperistalsis* (Fig. 21). The intensity of peristaltic vigor may vary from a slight exaggeration of wave depths to an almost tumultuous energy of contraction, so that in the obstructive cases the stomach resembles a row of balls. Hyperperistalsis does not seem to be related to hyperacidity, because it has been seen in many cases of ulcer with low acidity, and cases of gastric ulcer, and especially cases of appendicitis with high acidity, have not shown this feature. It is not due to obstruction alone, as Carman has observed it when there was no obstruction. Attention is called to the intermittency of hyperperistalsis, and for this reason both the screen and plate method should be used, as it may be noted by the one and detected with the other.

(b) *Six-hour Residue.* This is perhaps the most important sign of lesion of the digestive tract, and occurs in a large proportion of cases of duodenal ulcer.

(c) *Hypermotility.* At the screen examination, the bismuth water, immediately after being swallowed, is seen to flow freely into the duodenum. This relaxation of the pylorus is in such marked contrast to the resistance which it ordinarily offers to immediate evacuation of the stomach, and occurs so frequently in duodenal ulcer that it assumes

¹ Arch. d. Mal. de l'App. Dig., 1913, vii, p. 361.

² Med. Klin., 1914, p. 240.

³ Carman, Journal American Medical Association, 1914, lxii, p. 980.

large proportions as a diagnostic sign, though it must be considered in nowise pathognomonic. Some of Carman's cases (Mayo Clinic), in which duodenal ulcer was suspected because of the rapid emptying of the stomach, were found to be perfectly normal at operation.

(d) *Hypertonus.* A hypertonic stomach is not necessarily diagnostic, but, in general, the tendency is toward hypertonicity in duodenal ulcer.



FIG. 21.—Deep peristaltic waves indicated by *P*; *D*, marks bismuth in duodenum; *Pyl.*, pylorus.

(e) *Deformity of Outline.* "Irregularities in the outline of the bulbus duodeni, where most ulcers occur, have received considerable exploitation as a reliable indication of duodenal ulcer, chiefly by those radiologists who have depended on plate findings rather than on screen examinations," but "irregularities of the duodenal wall are by no means pathognomonic of ulcer or even of a duodenal lesion. Such deformity of outline is often seen in adhesions and in cases of pressure, and even in spasm.

(f) *Lagging of Bismuth.* Normally, the duodenum empties itself so rapidly that it can scarcely be detected, whereas in ulcer the bismuth lies in the duodenum and shows distinctly a well-defined shadow. This sign was early noted and held to be characteristic, but it is by no means diagnostic, as it has been found quite often when the duodenum is normal and other intra-abdominal lesions exist.

Of all the signs described above, Carman lays particular emphasis on hyperperistalsis, especially when in conjunction with a six-hour residue, and claims that these features, when found in an otherwise normal stomach, constitute about the only evidence on which a purely radiologic diagnosis of duodenal ulcer may safely be advanced.

Carman's article is the best which has appeared on the subject during the past year, and being well written and profusely illustrated, forms a noteworthy contribution. A less important paper is that of Schlesinger.¹

Treatment. Ewald² believes that 50 per cent. are curable by medical means alone, and he claims that surgeons have an incorrect view of the internist's results, as they see only the uncured cases. The diagnosis must be made early if the treatment is to be of any avail and the disease must be recognized, before Moynihan's symptom-complex is seen, as this is indicative only of chronic ulcer. Of Ewald's 82 cases, only 18 were operated upon. Kümmell, although believing that medical treatment relieves symptoms, says that "just as appendicitis cannot be cured medically, so I believe that without operative interference, cure is only exceptionally effective."

Schütz³ does not think that medical treatment is far from useless, and says that it would seem to be an easier proposition than the treatment of gastric ulcer, as duodenal ulcers often heal without scar-tissue formation, a fact which renders the presumption probable that the healing is a matter of little difficulty. The treatment is entirely different from that used for gastric ulcer, as the symptomatology is different. In duodenal ulcer, the motility of the stomach is increased, in gastric ulcer, delayed. In gastric ulcer there is a direct mechanical irritation from the food and a continuous irritation of the hyperacid gastric juice. In duodenal ulcer, on account of the rapid passage of food through the stomach and duodenum, the symptoms are most pronounced after meals, when there is a continued outpouring of gastric juice into the duodenum. In *ulcus ventriculi* the diet should be sparse; in duodenal, this is not so necessary, and solid food is indicated. The hyperacidity and hypersecretion should be controlled by alkalies and belladonna, and rest is most imperative. Schütz claims to have cured speedily cases of duodenal ulcer, and he expresses the hope that the future will see more followers of the medical treatment idea and fewer of the slavish adherents of the Moynihan dictum that "cure of a chronic duodenal ulcer is impossible by means of medical treatment."

Recurrence of Symptoms after Operation. Ehrlich⁴ blames recurrence of symptoms after operation not on poor operative technique or on the failure of operation to produce results, but on the treatment which the patient receives after operation. It does not suffice to keep the patient in bed only eight to ten days, but the rest should continue until the stools are free from blood for at least three days, but better for five days. During this time he recommends hot compresses to the abdomen, for ten hours at a time. The diet should be strictly a vegetable regime until the benzidin test is no longer positive.

¹ Deut. med. Woch., 1914, p. 1155.

² Wien kl. Woch., 1914, p. 1.

³ Loc. cit.

⁴ Deut. med. Woch., 1914, p. 496.

DUODENAL FEEDING. The indications for duodenal alimentation as given by Einhorn¹ are:

1. Ulcerations of stomach and duodenum.
2. Gastric dilatation without mechanical obstruction.
3. Cases where it is difficult to have food retained in the stomach—nervous vomiting, vomiting of pregnancy.
4. Diseases of the liver. I have discussed this under Cirrhosis of the Liver, *q. v.*
5. Inoperable carcinoma of the stomach or cardia.

Nourishment is given every two hours, eight feedings being given in the day, and should consist of 250 c.c. of milk, one egg, and a teaspoonful of lactose. Occasionally milk-sugar causes diarrhea, in which case it must be omitted. Certain patients cannot take milk, and this may be replaced by water with barley or pea meal. All food must be given warm.

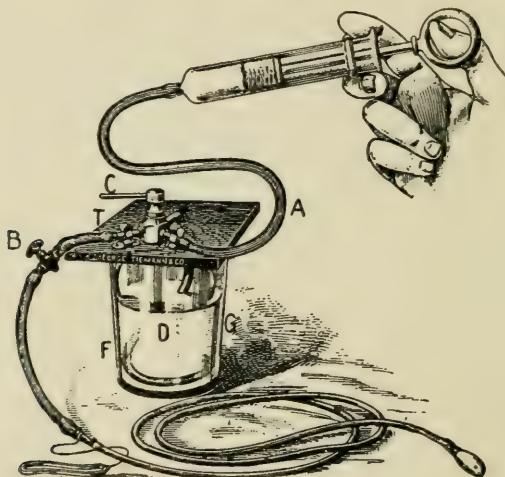


FIG. 22

The tube is introduced by having the patient swallow the capsule with a mouthful of water, and its position in the gastro-intestinal tract is determined by giving food and aspirating immediately. If the tube is in the stomach, acid contents will be obtained; if in the duodenum, no liquid can be aspirated. It usually takes about three hours for the tube to reach the duodenum, but in cases of pylorospasm, twenty-four hours will often elapse before this result is attained.

The tube may be left in for two weeks when necessary, and during this time the mouth should be kept clean with a mouth wash. At least 500 to 1000 c.c. of salt solution should be given in a day. The apparatus used by Einhorn is shown in Fig. 22.

¹ Deut. med. Woch., 1913, p. 1404.

Lazarus¹ extols the procedure in no uncertain terms. He prefers a solution of 1 liter of cream, 100 c.c. of milk, 50 grams of butter, 60 grams of lactose, and the yolks of 5 eggs, which is prepared in the morning, and of which a portion is given every one or two hours. When forced feeding is indicated, he uses the following:

		Protein.	Fat.	Carbohydrates.	Calories.
Milk	500 c.c.	16.95	18.4	24.7	342
Cream	1000 "	41.2	238.0	39.2	2543
Tropon	50 gr.	43.3	0.9	2.0	178
Four egg yolk	62 "	9.7	18.84	0.28	216
Sesame oil	30 "	—	30.0	—	—
Ground rice	50 "	3.69	0.35	39.5	180
Lactose	60 "	—	—	60.0	246
Salt	10 "	—	—	—	—

Metabolic studies have been made by Reuss,² in whose article numerous tables may be found. The essential feature of his work is, that there is almost a normal absorption of nitrogen and of fat, a fact which had already been determined by Einhorn and Rosenbloom.³

Primary Carcinoma of the Duodenum. This rare condition (0.3 per cent. of all cases of carcinoma) has occurred in a case of Bibby and Stewart.⁴ Although the authors wish to avoid speculation as to the origin of the neoplasm, it would have been perhaps advantageous to consider duodenal ulcer as the principal seat. It is a well-known and well-established fact that carcinoma rarely develops on the site of a duodenal ulcer, but, nevertheless, there are certain features in this individual's history which point to the preexistence of such a condition.

Congenital Atresia of the Duodenum. Such cases have hitherto been held to have but two etiologic moments: (1) congenital defect of the duodenum, and (2) pancreas annulare—the condition in which, as a result of an anomaly of "anlage," the pancreas encircles the duodenum like a ring. To these two causes must be added a third, namely, *situs inversus viscerum partialis*.⁵

Large Intestine. **FUNCTIONS OF THE LARGE INTESTINE.** After tracing the evolution of the large intestine, Griffiths,⁶ proceeds to discuss the part the gut plays in the assimilation of food. The first portion of the bowel is especially designed for delaying the onward and outward flow of the intestinal contents and the *caput* allows of a back flow with eddies more or less pronounced according to the degree of fluidity of the contents and the force with which the stream enters.

¹ Berl. kl. Woch., 1913, p. 1391.

² Ibid., 1914, p. 1023.

³ Internat. Beitr. z. Pathol. d. Ernährungsstör., Band 3, H. 1.

⁴ Lancet, 1914, i, p. 525.

⁵ Melchoir, Berl. kl. Woch., 1914, p. 1161.

⁶ British Medical Journal, 1913, ii, p. 1469.

In addition to the formation of a large lumen and a recess, the muscular coat is arranged in three distinct bands, wide or narrow, with definite intervals. Being of shorter length than the gut, these bands act much as a "garter does in a garment." The result is to induce a movement which continues the work set up by the establishment of eddies.

The mixing which results from its anatomical arrangement occurs especially in the cecum, but also throughout the entire length of the intestine. There is another important process which goes on at the same time, namely, the rapid absorption of water (70 per cent. being absorbed during transit through the large intestine). The mixing and drying occurring simultaneously in the first portion of the large intestine. As the contents become dryer they become formed into roundish masses of the size natural to the gut beyond.

To resume: In the first portion of the large intestine, the contents of the ileum accumulate, undergo a thorough mixing or churning, lose the greater portion of their water, and then become molded into shape for propulsion.

This propulsion depends on (1) the strength of the muscular wall and accessory power of the abdominal walls; (2) the fluidity of the contents; (3) the amount and quality of the lubricant. The power in the wall of the gut is derived from the central or subsidiary nervous system, and Griffith says the amount transmitted to this portion of the gut depends directly upon the amount available, and upon that portion left unconsumed by exercise or the will. "For example, if the will insists on the brain working until all the energy available is consumed, there will be none left to supply the muscular wall of the large intestine; or if the nerve energy be consumed in excessive exercise or work, again there will be none left." If the lumen is large from too great an accumulation, the less effective will be the contraction of the muscle, and the less the degree of lubrication, the greater must be the friction.

The lubricant is mucus, and the amount should vary directly with the degree of dryness of the fecal contents, although there is no power known which automatically regulates the supply.

CHRONIC INTESTINAL STASIS. *A propos* of an address by Lane¹ and remarks made by Bainbridge² following the reading of this paper, there is an important and sane editorial, which so well sounds the temperate note that I transcribe parts of it with expressions of appreciation to its unknown writer.³

"The subject of chronic intestinal stasis and its surgical treatment has been so much before the profession recently that some impatience at return to it may be excusable. But we venture to think the more

¹ British Medical Journal, 1913, ii, p. 1125.

² Ibid., p. 1129.

³ Ibid., ii, p. 1174.

such a difficult matter is discussed, and the more extensively experience is recorded, the sooner will it be lifted out of the realm of the controversial, and become established theory and tried practice, or otherwise. Sir Arbuthnot Lane has already, with some frequency and persistence, called the attention of the profession to a long train of symptoms of great range and variety which, he thinks, directly and indirectly result from chronic interference with the 'general drainage system of the body.' Surgeons, we know, are by no means unanimous in their acceptance of the theory or in their recognition of the sequence of events indicated by Sir Arbuthnot Lane. Whatever may be the first origin of the ileal band, or Jackson's membrane, or Payr's spleno-colic band, or the sigmoid adhesions, whether inflammatory, evolutionary, or developmental, there can be no doubt that they are found and that each and all of them may interfere very seriously with the onward course of the intestinal contents, and by damming back fecal material cause absorption of toxins with attendant effects. There can be no scepticism or questioning of the truth that chronic obstructive symptoms follow from the presence of these bands. But when we are asked to go further we find that on the broad back of chronic intestinal stasis is laid such a burden as is indicated in the seventeen direct results and nine indirect consequences described in Sir Arbuthnot Lane's address, many may perhaps feel that their scientific good nature is being strained. Hitherto, so far as we know, the profession has had to rely more or less on general statements that these things were so. Surgeons all over the world have read with interest his addresses, and should have had ample opportunity and time to record their experiences and check his results by theirs. We venture to hope that the publication of the details of the cases illustrating the address will lead to other publications, so that the whole body of the profession will be as convinced as the author of the accuracy of his observations, the soundness of his deductions, and the efficiency of the treatment he advocates. We are at present in want of further details as to the pathology of these cases.

"What the actual results of the operative treatment are, we have an opportunity of learning both from the details of Sir Arbuthnot Lane's seventeen cases and from the statistics provided by Dr. Bainbridge. Perusal of the latter's paper will show that he is an enthusiastic supporter of the views of Sir Arbuthnot Lane. His enthusiasm is founded on repeated animal observations, and on the statistical study which he has made of, we presume, cases of chronic intestinal stasis only. The figures are taken entirely from one ward—apparently a female one—and extend over a period of three and a half years. The mortality rate is astonishingly low, and the results in betterment of the health of the patients appear fully to justify the treatment. Statistics do not appeal to all, but the knowledge of personal friends

restored to vigor and happiness weighs mightily, and probably that knowledge is in the possession of many of us."

Addresses there have been a plenty on this subject, and the pages of the *British Medical Journal* groan beneath four of them. Adami,¹ whose address gives the stand-point of the clear thinker and unsentimental scientist, spares no pain in the flaying of Lane, and no words in the ridicule of his theories. Lane's belief that food products being delayed in their passage through the intestines are absorbed and produce signs of poisoning, Adami holds as fallacious, claiming that experimentally such toxins cannot be shown to exist. He ascribes rather some of the pernicious symptoms seen in Lane's patients to sub-infection, that is, to the carriage in of bacteria through the mucous membrane at any point from the mouth to the anus, particularly the carriage of *B. coli*.

AUTO-INTOXICATION. Barger and Dale, in their studies on Ergotoxin, succeeded in isolating from this mixture of substances a chemical body, B. Imid-azolylethylamin. The latter represents an amino base, which is identical with the decomposition of histidin, itself a decomposition product of protein. They called this substance histamin, and found that it had certain toxic properties identical with those poisons which act as exciters of the autonomous nervous system. When injected intravenously, there is sinking of the peripheral blood-pressure, and an increase of pressure in the pulmonary artery. It causes spasm of the bronchi, bradycardia, contractions of the uterus, and lessens the flow of saliva and feces. Dale and Barger were able to isolate histamin from the intestinal mucosa and believe it is identical with secretin. This base and another base derived from tyrosintyramin are known decomposition products, but Eppinger and Gutmann² infer that there must be many others, which are being produced continually, and which must be present in the stools. They have, therefore, conducted an eminently scientific research on these decomposition bases, as a whole, in health and in disease.

The authors attempted to study whether there was any parallelism between the severity of the symptoms and the amount of amino bases. In two normal cases, the latter were found to be 1.4 to 1.5 per cent., and, in two others, values of 12.8 and 19.8 per cent. were encountered. The last two figures were equal to those seen in an unusually severe case of dysentery (17.1 to 24.7 per cent.), and it would seem that there can be but very little causal relation. Eppinger and Gutmann state, however, that before such an assumption can be considered, it would be well to debate whether, in the normal cases, an intact intestinal mucosa and a normally functioning liver may not play a great defensive role. Efforts to isolate histamin in pathologic and

¹ British Medical Journal, January 24, 1914.

² Zeitschr. f. kl. Med., 1913, lxxviii, p. 399.

normal stools, were rewarded by finding no appreciable difference in the amounts in either.

Their paper is an important contribution and is along the lines laid down by Eppinger and Hess in their work on the correlations of glands of internal secretion. It is enough to prove that substances analogous to those which excite the vagus, are produced in the intestinal canal, and it is only fair to presume that their absorption may account for some of the intoxication seen in gastro-intestinal diseases. If they have any action in health, and this has not been more closely studied, one must be forced to regard the intestine as behaving like a gland of internal secretion, and conditions of hyper- and hypofunctioning immediately suggest themselves.

Not too much praise can be given to Eppinger and Gutmann for such careful thought as is shown in the selection of their theme and its subsequent development. The subject of auto-intoxication has long been veiled in mystery and has too often been resorted to as a diagnostic refuge when no other port of safety was in sight. Unfortunately, the beacon light was generally indican, a substance which, when it was found in the urine, immediately flashed out "auto-intoxication." The significance of this body is certainly very little, as I have previously contended, and, despite assertions of men more eminent than the writer of these lines, cannot with any justification be held to be an index of alimentary toxemia. It is especially gratifying, therefore, to see that auto-intoxication is being scientifically studied, and such work as that described above is certain to be productive of much lasting value.

Baar¹ speaks as follows about indican: "Instead of guessing as to the diagnosis in those cases which come under our observation with definite gastro-intestinal symptoms, we should regularly test the twenty-four-hour urine for indican, and after making twenty or thirty of such tests, we should, with due consideration for all other clinical symptoms, be able to make a diagnosis. One single test has no value at all, and it is only the repeated examination of the urine for indican which will throw additional light on those obscure lesions of the gastro-intestinal tract which for years may not show any definite symptoms.

"If we make these tests, we shall find that we can divide the indicanuria cases into three types: (1) Transitory, due to some transitory anatomic lesions or temporary insufficiency of gastro-intestinal secretions (psychic). (2) Constant, due to permanent or progressive anatomic lesions of the gastro-intestinal tract or to permanent insufficiency of the gastro-intestinal secretion (earmarks of hypoplastic constitutional anomaly). In these latter cases, about 1.5 per cent. of all, we can remove indicanuria and many of the clinical symptoms by high colonic lavage. (3) Recurrent, due to some recurrent anatomic

¹ Northwest Medical, 1913, p. 185.

lesion of the gastro-intestinal tract. High colonic lavage will remove this type of indicanuria only when the lesion is located in the colon; if the lesion be higher up, however, high colonic lavage will have no influence whatever. Indicanuria in these cases is quite often the only positive evidence of gastro-intestinal lesions which requires surgical interference (chronic appendicitis, cholecystitis, ulcer of duodenum or stomach).

I confess I am at a loss to understand the meaning of "transitory anatomic lesions" and "permanent anatomic lesions," and it is incomprehensible how one can remove the anatomic lesions by colonic lavage if these lesions are permanent.

At random I pick out some of Baar's sentences, "In fact all anatomic lesions of the gastro-intestinal tract show indicanuria." By dividing his cases into the three groups, he writes, "I could use the indicanuria for differential diagnostic purposes between nervous (!), mucous colitis, and symptomatic (!) mucous colitis, recurrent indicanuria being present when the mucous colitis was merely a symptom of gall-bladder disease, appendicitis, or ulcer, while the true nervous mucous colitis showed no indicanuria. In cases of diarrhea, I could positively state whether or not the disease was due to nervous disturbance only or was connected with real anatomic lesions by simply following the indican excretion."

Frenkel and Franco¹ believe the chief source of indican in the urine is to be found in gastro-intestinal hemorrhage, and suggests that, in all cases of indicanuria, careful examination of the feces should be made for occult blood. They claim that tryptophan-forming protein may also lead to indicanuria, and of course believe that hemorrhagic conditions at times may not be associated with indican, but offer no explanation for this apparent contradiction. They attack Baar's theories, claiming his conception of indicanuria is too narrow and restricted.

CONSTIPATION. Since the causes of constipation are too numerous to mention, and since its etiology may be said to be due to medical and surgical diseases occurring from the brain to the anus, Kemp² wisely limits himself to the discussion of the relation of enteroptosis with moderate angulations and slight adhesion, to constipation. He advises that all cases of chronic constipation be carefully studied with the *x*-rays. When adhesions are definitely diagnosed, the case is an operative one, but much can be done for the enteroptotic patients by the use of belts, corsets, adhesive strapping, and by increasing the amount of intra-abdominal fat.

Hormonal. The number of papers devoted to this dangerous drug or therapeutic measure designed to cure constipation, has fallen off

¹ Arch. f. Verd. kr., 1913, xix, p. 420.

² New York Medical Journal, 1913, xcvi, p. 5.

since the first recommendation by Zuelzer a few years since (1911). This year I find but one, and that by Hesse.¹ On the basis of seven cases, he writes a lengthy article, in which he apparently realizes that the drug is not harmless, but advocating its use nevertheless. I have nothing to add to my former criticism in preceding numbers of PROGRESSIVE MEDICINE, and still insist that it is a dangerous preparation and should not be employed.

Sennatin. This drug, which I discussed last year in PROGRESSIVE MEDICINE (p. 76), has been used successfully by Drews² in doses of 2 grains given intramuscularly. Drews considers it a safe and thoroughly reliable means of combating constipation.

Istizin. This synthetic anthraquinone preparation, prepared in tablets of 0.3 gram and given in doses of 0.15 gram, is said by v. Cancrin³ and Klare⁴ to be very useful in constipation.

INTESTINAL OBSTRUCTION. *Cause of Death.* Whipple and his co-workers⁵ believed that death was caused by poisons arising from the duodenal mucosa, but Hartwell, Hoguet and Beekman⁶ hold that the essential factor does not lie in the poisons *per se*, but in the productions of lesions which favor their abnormal absorption, and lacking these lesions the animals die only from dehydration, or starvation if dehydration is prevented. Although recognizing that it is not always safe to apply the findings of experimental work to clinical practice, they believe certain applications seem justified.

"It is a familiar observation that a chronic obstruction may take place in the bowel and progress until the opening is only pin-point in size, yet no serious symptoms arise, even though there may be for many days cessation of fecal passage from the bowels. When, however, a complete closure supervenes, there arises immediate evidence of a severe condition. The well-known symptoms of intestinal obstruction are manifest. The explanation of this is found in the fact that so long as gas can escape through the constriction, there is no distention of the intestine, and hence no damage to the intestinal wall, and no absorption of poisonous materials. The stoppage of gas, however, is immediately followed by both these conditions, and, unless promptly relieved, will result fatally.

"The practical application of the principles elaborated by the experimental work follows two lines. First, the water extracted from the tissues by the enormous outpouring into the bowel must be replaced. This can easily be done by means of a continuous hypodermoclysis administered under the skin in the pectoral region by use of needles of the ordinary hypodermic caliber, but longer. In this way the fluid

¹ Therap. Monatshefte, 1913, p. 698.

² Deut. med. Woch., 1914, p. 497.

³ Ibid., p. 230.

⁴ Ibid., p. 440.

⁵ PROGRESSIVE MEDICINE, December, 1913, p. 84.

⁶ Arch. Int. Med., 1914, xiii, p. 701.

is absorbed almost as rapidly as it enters, 1 or 2 liters being given without withdrawing the needles. The absorption will continue until the normal water content of the tissues is reestablished. Since, however, this has no influence on the symptoms resulting from a damaged intestinal wall, it is imperative to relieve the obstruction surgically as early as it is discovered.

"A second point of practical importance is derived from our experiments, that is, an answer to the question as to the advisability of opening the bowel, and either temporarily or permanently draining off the contents. Whenever there has resulted from the obstruction any considerable damage to the bowel wall above the constricted point, by reason of distention and circulatory changes, there is danger of serious symptoms arising from the absorption of these materials resulting from these changes. Therefore, in the presence of such changes, the more rapid emptying of the bowel through an enterostomy than through a normal path, after relieving the obstruction, may be a wise thing to do. Whether the drainage of the intestine shall be made to continue after primary emptying as much as may be possible of the distended bowel depends on the extent of the damage done. If this is great in amount, it may be advisable to establish an enterostomy, because there will be some further accumulations of the poisons which will be absorbed unless there is a free exit for them. Such an enterostomy will be necessary if the contents of the bowel above the obstruction is blood-tinged, demonstrating a damage to the bowel wall. If it is simply fluid feces, the rapidly returning peristalsis, after the obstruction is released, will force the contents onward, and there will be no danger of poisonous absorption when once it gets into normal bowel below the obstruction, because the mucosa here possesses a defense against absorption."

Intestinal Obstruction Due to Gall-stone. An additional case of this comparatively rare condition is reported by Gibbon.¹ The stone was six inches in its greatest circumference and four and a half in the lesser, and the length was two and a half inches.²

Novac's³ paper contains illustrations of a large gall-stone passed per rectum. The stone was 2.625 inches in length, 3.5 inches in circumference, and weighed 324 grains. The stone was smaller than the one described by Gibbon, but was sufficiently large to have caused obstruction had conditions been unfortunately favorable.

CHRONIC ULCERATIVE COLITIS (*Colitis Suppurativa Gravis Ulcerosa*). This condition may be defined as a severe, slowly developing ulceration of the mucous membrane of the large intestine,

¹ Journal American Medical Association, 1914, lxii, p. 694.

² PROGRESSIVE MEDICINE, 5913, p. 85.

³ New York Medical Journal January 31, 1914, p. 214.

involving even the sigmoid flexure and the rectum. The onset may be acute, with fever.¹

The disease is one of young individuals in the second or third decade of life, and more women seem to be affected than men. Although the majority of cases run a chronic course, the disease may be acute in onset, and with acute symptoms, lead to death. Often pus formation is seen, and this is the basis for Schmidt's suggestion that the term *colitis suppurativa* be judiciously employed. Constitutional symptoms are frequently seen—fever, emaciation, and progressive weakness. The mortality is high, and the prognosis should always be guarded.

The treatment is essentially dietetic (milk being the best diet) and medicinal. Calomel and ipecac per os have admirers, although Schmidt favors rectal irrigation. The latter may include dermatol, iodoform, silver nitrate or protargol, hydrogen peroxid, balsam of Peru, ichthylol, and quinine. Of these, iodoform and protargol seem to be most efficacious.

Surgical interference was undertaken in 15 of Schmidt's cases, and of these, 2 were cured, 7 improved, 2 unimproved, and 3 died, and 1 was lost sight of. Schmidt weighs thoughtfully the advantages of surgical and medical treatment, and believes that surgery should be employed only after medical treatment has proved of no avail, excepting those cases with acute onset, and acute course.

Spitzig² believes that hypertonicity of the vagal tract (vagotomy, vagotonia) is closely related to mucous colitis. Based on this idea, he gives, as a routine measure, 5 drops of the tincture of belladonna or $\frac{1}{6}$ grain of the extract until symptoms of dry throat and mydriasis appear. The dose is then decreased, and thereafter varied to suit the individual tolerance. Medication is continued for one or two weeks, until all abdominal soreness has disappeared, and tenderness is no longer evoked by palpation of the affected colon. After an intermission of two weeks, another course of belladonna is begun. Although dietetic measures are not neglected, the author feels that irrigations are indicated only from "diplomacy."

CANCER OF THE COLON. This is generally a primary disease, but occasionally the intestine becomes involved by extension from a neighboring viscus. The greatest number of cases occur between the ages of forty and sixty-five years, although there are more cases under forty years than in cancer of any other part. Seventeen per cent. of all intestinal cancers occur between the ages of thirty and forty years.

It is impossible to speak of early symptoms, as patients rarely seek advice until signs of obstruction are apparent. In the rapid-growing cancers, called by White "fungating," highly offensive movements

¹ Schmidt, *Mitt. a. d. Grenzgeb.*, 1913, xxvii, p. 150.

² *Journal American Medical Association*, 1914, lxii, p. 364.

mixed with blood and pus and rapid deterioration of health are conspicuous signs; but in the sclerosing variety there is nothing to indicate the disease until symptoms of obstruction appear. Of these, the earliest manifestations are increasing constipation, occasional attacks of diarrhea alternating with constipation, and colicky pains. Later the abdomen becomes distended, the tongue coated, and the breath heavy, with impairment of appetite and digestion. There is not much to be learned on palpation as a growth may be present and yet remain undetected.

In obstruction from cancer, distention precedes vomiting by some days, and the vomiting is not so rapidly progressive as in strangulation. Peristalsis is readily seen and felt, and is always associated with increase of pain. Surgical interference is always indicated as soon as the diagnosis becomes certain.¹

APPENDICITIS. The frequent association of chronic inflammation of the appendix with persistent gastro-intestinal disturbances is being more and more recognized, but the diagnosis of chronic or subacute appendicitis is, nevertheless, a matter of no little difficulty, particularly in those cases which have had no history of a previous acute attack. In many instances, pain in the right iliac fossa, either spontaneous or induced by pressure, furnishes the clue to the diagnosis, but in many other instances there is an absence of this feature, the chief symptom being abdominal pain of more or less definiteness. Granting that there is well-marked pain in the right iliac fossa, one is still not justified in concluding that the cause of the pain is appendicular in origin, without excluding disease of organs situated in the right upper and lower quadrant of the abdomen, notably the Fallopian tube, ovary, kidney, and gall-bladder, a matter at times beset with difficulty.

Last year² I spoke of the favorable impression the use of colonic inflation had made as a means of diagnosing chronic appendicitis. Since then I have made use of the method in a large series of salpingitis, appendicitis, and other abdominal conditions with results which are not in accordance with those of other writers. There were, in a series of positive tests, three cases which had no indication of appendicular lesion, and of the negative tests seven had appendices chronically inflamed and bound down by adhesions.

I believe that inflation of the colon is an equivocal means of diagnosing chronic appendicitis. Some cases have negative tests and some have positive, and there seems to be no constancy in the results obtained. In acute appendicitis the method should not be employed. It is rarely necessary as a diagnostic aid, and there is too much risk of injuring the intestine. The method must not be considered useless,

¹ White, British Medical Journal, 1913, ii, p. 57.

² PROGRESSIVE MEDICINE, p. 93.

however, for at times, in our experience, the diagnosis has been materially strengthened by its employment, and operation has later shown the wisdom of our faith. It must be considered, however, merely as an *aid* in the diagnosis, history and physical examination being far more valuable. In a series of normal individuals, no positive reactions were observed.¹

Appendicitis Simulating Coxalgia (Claudicating Appendicitis). Rochard and Stern² have reported three cases of chronic appendicitis which were treated for hip disease for various lengths of time, one even having an extension apparatus applied. The symptoms were pain in the right hip and intermittent claudication whenever fatigued. There was no history of any acute or long lasting pain in the appendiceal region. Careful examination did not reveal the usual signs of coxalgia, and the authors urge physicians to bear in mind these signs of what they term claudicating appendicitis. All three of their cases, it may be stated, recovered by removal of what were found to be diseased appendices.

Appendicitis Simulating Renal Colic. Such a case is recorded by Hughes.³

In a case of Pollag,⁴ a curious cause of an attack of appendicitis was found to be a chain of segments of *tenia solium*. As a matter of fact, the appendix was but slightly diseased, but the cecum was filled with a large mass of parasites, a few segments of which were protruding into the appendix. On cutting and cauterizing the latter, the mass withdrew itself into the large bowel, where it formed a thick, ball-like mass. It is not infrequent to have a migration of certain intestinal parasites (*oxyuris*, *ascarides*) into the appendix, but this seems to be the first case on record when tapeworms have entered this structure.

CECUM MOBILE. Hausmann, the "discoverer" of cecum mobile, apologizes for still another paper on this subject, but offers as an excuse the fact that he was the first to describe the condition. He believes now that cecum mobile results not only from a long mesentery, but also from relaxed retrocecal tissue. It may always be recognized by palpation, although the form cannot be diagnosed. Clinically, only a few of the cases have symptoms, and the latter only when there is some inflammatory narrowing of a distal part of the intestine.

INTESTINAL SAND. Attention is first drawn to the stool by many black or brown particles intimately mixed with the feces, giving to the latter a peppered appearance. This sand under the microscope in Talbot's case⁵ was found to consist of two kinds, one of which was colorless and resembled calcium or magnesium phosphate, and the other irregular or oval, sometimes crystalline, with rough or smooth

¹ American Journal Medical Sciences, September, 1914.

² Presse Médicale, 1913, p. 827.

³ British Medical Journal, 1914, i, p. 244.

⁴ Münch. med. Woch., 1913, p. 2119.

⁵ Journal American Medical Association, 1913, lxi, p. 238.

edges. The color varied from a light yellow to a beautiful, deep claret red.

The chemical analysis showed the sand to have the following composition:

Nitrogen	3.0 per cent.
Total fat	5.0 per cent.
Ash	17.4 per cent.
Calcium	7.4 per cent.
Magnesium	2.0 per cent.
Phosphates	Present
Resinous material (?)	14.0 per cent.

It has been suggested that intestinal sand follows the ingestion of bananas, but in Talbot's patient this was not the case. He believes there may have been some relation between the sand and the symptoms of the subject of his report.

NUTRITIVE ENEMATA. The old strife as to whether a patient may be kept in metabolic equilibrium by the use of nutritive enemata has been entered into by d'Agata.¹ Elaborate studies were made following the use of an enema containing 200 c.c. of broth, the yolks of two eggs, 25 c.c. marsala, and a pinch of salt given every six hours. Those interested may find in the article full tables concerning the analyses, so it will be sufficient to give the author's conclusion. He is convinced that nutritive enemas have a certain food value, and although this method of feeding is not comparable with oral feeding, still it is assuredly of great help when food, for any reason, cannot be given by mouth.

PARENTERAL FEEDING. Schott² believes that nutritive enemata by no means provide a sure means of furnishing the body foodstuffs in cases where food cannot be taken by mouth. He has therefore made elaborate studies on dogs with the intravenous injection of egg yellow. The work is most suggestive, and although the author is careful to draw no deductions applicable to man, the clinician will see in the article much of interest.

The egg-yolk was given in a normal salt solution, and it was found that up to the appearance of anaphylaxis, nitrogen and weight equilibrium was maintained. The fat of the egg disappeared from the blood within an hour and a half, and seemed to be completely utilized, while the albumen was more slowly, but almost equally well, combusted. Carbohydrates, given in the form of a dextrose solution, seem to influence nitrogen metabolism as they do when administered by bowel.

The great danger in this parenteral method of furnishing foodstuffs lies in the phenomenon of anaphylaxis. The time when this appeared varied with the animals used: in rabbits it was seen in four or five days,

¹ Berl. kl. Woch., 1914, p. 638.

² Deut. Arch. f. kl. Med., 1913, cxii, p. 403.

in dogs, in fourteen days. This seems to be the only danger. The blood behaves exactly as after a meal, that is, there is a digestion leukocytosis. Blood-pressure is uninfluenced any more than after a customary intravenous injection, and there are no ill-effects on the heart and bloodvessels. He hints at the probability of the liver being the organ where utilization of the foodstuffs takes place.

As was stated above, no clinical application of this work is hinted at, but it is apparent that the suggestive feature lies in the fact that the body is able to utilize food introduced parenterally, and by this means maintain itself for a time in a normal condition.

VISCERAL LESIONS OF PURPURA. Although purpura does not properly belong in this department of PROGRESSIVE MEDICINE, its gastro-intestinal manifestations make it incumbent upon the writer to consider it. Osler¹ has devoted a lengthy article to discussion of purpura and its protean nature.

Of the gastro-intestinal symptoms, colic, transient in nature, but recurring, is the commonest. The attacks may be of great severity, and occurring chiefly at night, and causing the patient to writhe in bed. They seem to be independent of diet, and occur usually with the skin rash. The pain is central but may radiate to all parts, but with this the abdomen is flat and not painful on pressure. Vomiting is almost as frequent as colic, and in severe cases of purpura, hematemesis is common. Diarrhea is not nearly so common as vomiting, and may be either lienteric or watery, with blood and mucus.

I have seen this year two cases of purpura, both with marked skin lesions and both with severe gastro-intestinal symptoms, *i. e.*, colic and hematemesis. One patient had all the symptoms of acute intestinal obstruction, and such was the diagnosis on admission to the hospital. The other was a case diagnosed as gastric ulcer on account of the pain and the persistent bloody vomiting. The latter case responded well to salicylates administered per rectum.

GASTRO-INTESTINAL HEMORRHAGE. The difficulty one encounters at times of checking a persistent hemorrhage from the stomach or intestine, makes welcome any suggestion for the treatment of this distressing symptom.

Nottebaum² recommends the use of tincture of iodine in the following form, a prescription which he has found most serviceable in typhoid fever and in other conditions with intestinal bleeding:

R—Tincturæ iodidi	1.5 c.c.
Natrii iodidi	0.1 gm.
Aquæ menthæ piperitæ,	
Siripi	20.0 c.c.
Aquæ destillatæ	200.0 c.c.

A teaspoonful is to be taken every half-hour for several doses, then every two hours.

¹ British Medical Journal 1914, i, p. 517.

² Deut. med. Woch., 1913, p. 2408.

DISEASES OF THE PERITONEUM.

Sensibility of the Peritoneal Cavity. Kappis¹ has deduced from the work which has been done so far on this question that there is no proof, either anatomic or physiologic, that pain impressions from abdominal viscera are conveyed to the central nervous system by means of the sympathetic and splanchnics. He believes, from his reading, that it is much more probable that the organs are of themselves sensitive to pain stimuli. Kappis admits that such a state of affairs is contradictory to every observation made on man, for it has been almost conclusively proved that the abdominal organs, with the exception of the mesentery, are insensitive. It is in order to solve this obvious contradiction that the author has studied the subject anew, with the following three questions as the main ones to be answered.

1. Has the visceral peritoneum a pain sense, and, if so, what is its mechanism?
2. How can spontaneous pain in man, such as that seen in ulcer, intestinal, biliary, or renal colic, in appendicitis, etc., be explained?
3. In which segment of the spinal cord and by what fibers does the pain travel?

As far as the technique is concerned, details will be found in the author's protocols, but it may be briefly stated that the operations were usually conducted in two stages, the one which he calls a preparatory stage and the other the stage of experimentation itself, in this way removing from the scope of the latter any chance of pain arising from the peritoneum in the field of experiment.

The stomach and intestinal wall, liver, and spleen were found to be insensitive to pinching, sticking with a pointed object, cutting and similar stimuli. On the other hand, the omentum was always sensitive to pain. If turpentine was injected into the wall of the stomach, there was no pain until the fluid reached the lesser or greater omentum and injections directly into the omentum caused such pain that the animal had to be killed.

Compression, or cutting the gall-bladder, was painless, but tugging on the same and compression of the cystic duct, the portal vessels, or common duct induced a quick pain response. Passage of a sound through the cystic duct caused no pain, but distention of the gall-bladder was most painful, due to the distention of the neck of the gall-bladder or by pulling on the portal vein.

The intestinal wall was never painful, but pull on the intestines and mesentery always was. Pinching of the free mesentery caused no pain, but compression of the mesenteric vessels was, and a typical

¹ Mitt. a. d. Grenzgeb. d. Med. und Chir., 1913, xxvi, p. 493.

intestinal colic was stimulated by distention of a piece of gut caught between two clamps. This was found to be due to a pull on the mesentery directly attached to the intestine, as with cutting of this attachment the pain ceased. Barium chloride injected into the intestinal wall caused tetanic contraction but no pain.

When the kidney was tugged at there was pain, as was the case when the ureter was clamped at any place along its course. The organ itself was devoid of pain sense.

Kappis recognizes the individual variations in the animals in their reaction to stimuli, but, taking this into consideration, he deduces the following facts:

There are many fibers running from the retroperitoneal ganglia to the viscera, along the course of the vessels, and containing sensory and pain fibers, but their number in comparison to the wide area supplied is very small. For this reason the pain fibers are either lost before they reach the organ or are so few and weak that they cannot transmit the pain impression. At all events, the abdominal viscera must be regarded as insensitive to pain.

Kappis does not claim that the visceral peritoneum is without power to transmit pain stimuli, for in those places where the nerves are numerous, as along the larger and smaller vessels to be found in the mesentery, lesser omentum, greater omentum at its gastric attachment, cystic duct, common duct, and portal vessels, pain is keenly appreciated.

His views regarding abdominal pain in man are as follows: In peritonitis the parietal peritoneum is the one mostly accountable, as has been so often stated. In ulcer, excluding pain of adhesions or pylorospasm, the pain does not arise in the gastric wall itself, but if the ulcer lies in the region of the attachment of the greater or lesser omentum (which contain pain fibers) the pain is due either to pulling on the omentum by movements of the stomach or by abdominal resorption in the diseased area. A highly acid gastric juice plays no role in the production of pain, as has been proved by the pouring of acid into the healthy or diseased stomach.

In gall-stones, the pain may be colicky in character or it may be more or less continuous. The typical colic occurs when there is an attempt to empty a pathologic content through the cystic duct. To do this there must be a contraction of the gall-bladder, by means of which the organ is made smaller. This is followed by a pull on the cystic duct and the portal vessels, which contain the sensory fibers and the muscular contraction being closing in character there is a remission of the pain. Kappis doubts that the passage of a stone through the cystic duct causes pain. If the stone lies in the common duct the pain may be colicky or continuous. The latter is due to pressure of the stone, or of the dilated ducts directly on the surrounding

tissues, while the colic is due to contraction of the gall-bladder or of the common duct.

In empyema of the gall-bladder or in acute cholecystitis, the pain is due to involvement of the parietal peritoneum, in part to inflammatory changes about the neck of the gall-bladder or portal vessels. The question of dilatation of the gall-bladder must be considered also.

Intestinal colic is due to distention and contraction of the bowel, causing a pull on the mesentery, also a tearing of the same.

Pains of gastric crises, plumbism, and arteriosclerosis are not explained by the author.

The pain of renal colic is due to tugging on the renal pelvis and ureter. To resume, then, Kappis holds that the organs themselves have no sensation but that the mesentery or its connections is the place where pain is first appreciated.

The result of his studies concerning the path the sensory fibers take was not entirely satisfactory, but he finds that the seat of pain from the stomach, the spleen, and the upper part of the small intestine is on the sixth and seventh dorsal, that from here to the thirteenth dorsal there is but a slow distribution to the intestines, and that the segments below the thirteenth dorsal supply the large intestine.

The liver belongs to the stomach-duodenum segment, while the kidney and ureter belong to the lumbar segment.

An interesting report on the same theme is by Hartmann,¹ who underwent an operation for umbilical hernia without anesthesia. Pain was not complained of so long as there was no tugging on the mesentery.

Tuberculous Peritonitis. The good effects following the injection of gas into the pleural cavity has induced Bruckner² to use nitrogen injections in a case of tuberculous peritonitis. He recalls the improvement noted after a simple laparotomy, this being ascribed simply to the entrance of air into the peritoneal cavity. Whether it is to the air, the oxygen, or the nitrogen that the improvement must be credited, he leaves an open question, but he has selected nitrogen gas for his work, inasmuch as it can be given most conveniently and most safely.

Bruckner employed in one case a boy, aged sixteen years, who had had three laparotomies without resulting benefit, repeated injections of nitrogen. The first injection followed paracentesis, and consisted of 500 c.c. of nitrogen. After nine days, a second injection was given (600 c.c.), and after sixteen days a third injection of 800 c.c. At this time it was not necessary to remove any fluid, and in a month ascites was not demonstrable. A fourth injection (600 c.c.) was given two months after the third treatment, as a localized collection of fluid was found. Six months later, the patient was pronounced cured, and although but one case is reported, the results were so striking that Bruckner is much encouraged about the use of this closed method of treatment.

¹ Münch. med. Woch., 1913, p. 2729.

² Berl. kl. Woch., 1914, p. 103.

Not so sound basically is the suggestion of Lawrie.¹ In two hopeless cases of tuberculous peritonitis in children he employed the following prescription:

R—Calcin. carb. (precip.)	128 grains
Ol. creosoti	32 minimis
Mucil. tragacanth.	q. s.
Potass. iodidi	16 grains
Saccharin	8 grains
Ol. menthæ pip <i>vel</i> anisi	5 minimis
Aquaæ	q. s. ad 8 ounces

Dose, two teaspoonfuls every four hours for a child of five years.

Laudanum or paregoric may be added if there is much pain or diarrhea.

Ascites. McDill² seems to have had marked success with silk lymphangioplasty in certain cases of ascites. The essentials of the method are that silk is passed into the peritoneal cavity, leaving the ends free, while the other ends are buried in the subcutaneous tissue of the abdomen. The procedure is no more formidable than a paracentesis abdominis, and need not confine the patient to bed for more than a day. I have had the operation performed in one case of marked ascites, but I failed to note any improvement in the man's condition. The fluid seemed in nowise to diminish, in fact subsequent tappings were found to be imperative.

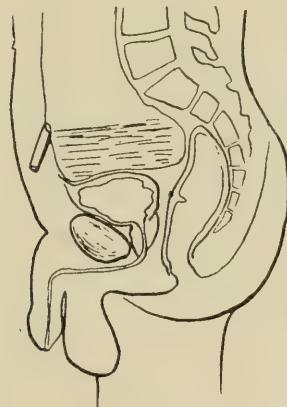


FIG. 23

Schepelmann³ uses a formalin hardened artery, which he buries in the peritoneal cavity bringing the distal end into the subcutaneous tissue of the abdominal wall, the procedure being accomplished under local anesthesia.

¹ British Medical Journal, 1913, i, p. 1433.

² Surgery, Gynecology, and Obstetrics, 1913, xvii, p. 523.

³ Virch. Arch., 1913, ccxiv, p. 279.

EOSINOPHILE ASCITES. Eosinophile ascites, according to Rolleston,¹ has hardly ever been recorded. His case was a male, aged fifty-two, whose ascitic fluid contained 22 per cent. of eosinophiles. Several weeks after admission, the patient had acute peritonitis and died, and at autopsy the fluid contained but 0.5 per cent. Hydatid disease was considered as a possible cause, but this was excluded by the postmortem examination which revealed a colloid carcinoma of the ascending colon just above the cecal valve. Hemic eosinophilia has been seen in abdominal carcinoma, and Rolleston quotes Emery as saying, in a private communication, that on one occasion he found 10 per cent. eosinophiles in the ascitic fluid of a man who afterward died of abdominal malignant disease. Rolleston suggests that hemic eosinophilia in the absence of animal parasites may be connected with the presence of carcinoma. It would be of interest to make a differential count of the blood and ascitic cells in cases of abdominal disease, a research which the writer proposes to undertake.

DISEASES OF THE LIVER.

Cirrhosis of the Liver. **FUNCTIONAL TESTS OF HEPATIC INSUFFICIENCY.** During the past decade the diagnosis of diseases of structure by the recognition of disturbance of one or more functions of that organ has been the theme of much research. A functional test, to be ideal, must be specific for that organ alone which is to be tested, and must not depend secondarily on the normality of other organs or of groups of other organs. Recent experimentation has shown that but few organs work and fulfil their functions independently of other organs, but that each organ is intimately associated with other organs to such an extent that its individual function or functions may be interfered with by disease of structure far removed from it in similarity, either of structure or function. Recognition of this fact, the intercorrelation of glandular activities should make one more critical of his functional methods.

The liver, when diseased, was early selected as a suitable organ on which to try functional tests, and, owing to the multiplicity of its activities, many tests have been suggested and are still being advocated. The test which has held its place the longest and which seems at present to be held in greatest esteem is the levulose test, which consists in giving the patient a certain amount of levulose, following which the urine is tested at different intervals for levulose. In health, amounts up to 100 grams should be utilized completely, although some individuals have a lowered tolerance for carbohydrates, and excrete levulose after the injection of this or smaller amounts.

(a) *Alimentary Levulosuria.* Hohlweg,² who several years ago was among the first to extol levulose as a functional test, contributes a second

¹ British Medical Journal, 1914, i, p. 238.

² Munch. med. Woch., 1913, p. 2271.

article, which is no less favorable in tone. He believes that the degree of liver injury may be suspected from the amounts of levulose assimilated. Thus, the more extensive the disease, the less levulose will be utilized. As a test for levulose, he relies on the Seliwanoff test, which I believe is of value, but no more so than the customary Fehling's test.

In cases of stone in the common duct with icterus, provided the obstruction was complete, alimentary levulosuria appeared even after 50 grams of levulose. In one case, four weeks after the calculus was removed, there was lowered sugar tolerance, indicating some severe degree of liver injury in such cases of stone. He expresses the belief that obscure cases of colic about which the patient seeks advice may be differentiated as far as diagnosing hepatic colic, on the one hand, from gastric and intestinal crises and renal colic on the other.

Stones in the gall-bladder or cystic duct have no effect on the levulose tolerance. In tumors of the liver there is no decrease, or but very little, even when there is complete obstruction of the common duct. This difference between stone and carcinoma, in their effect on sugar tolerance, is believed to be due to the fact that when a calculus blocks the duct the obstruction is an acute one, while in cancer the blocking is gradual and the liver has time to accommodate itself to the altered conditions. I have always felt that, in cases of carcinoma of the liver, the liver function, as far as levulose is concerned, is little affected, because the cancer cells seem to assume, to a certain extent, the function of the original liver tissue.

In cirrhosis, the results were confusing, as some cases assimilated large amounts of sugar and some small amounts, and there was even this difference seen in individual patients. With improvement there is an increased tolerance. In enlargement occurring in the course of leukemia, anemias, echinococcus disease and congestion, the tolerance is not much affected. These observations of Hohlweg were conducted on 100 patients, and they led him to have faith in the method as a good clinical index of changes in liver tissue.

Arai,¹ working in Japan, has found that the normal tolerance is only 50 grams, a fact at variance with other observers, notably Hofmeister who was the first to work out the tolerance of various sugars. Can it be that the Japanese react differently to carbohydrates than do we of the Western World? Although Arai's work has not the weight which accrues only from a large series of cases, yet his results are, in the main, those of his predecessors, with this difference; that he recommends 50 or 30 grams never 100. He prefers, as a test for levulose, the Nylander reagent.

With the knowledge that, in diabetes, sugar appears in the urine because of its increased concentration in the blood, it is of supreme interest to know if in these cases of alimentary levulosuria there is a tem-

¹ Deut. med. Woch., 1914, p. 792.

porary flooding of the blood with levulose, an alimentary levulosemia, or as Schirokauer¹ puts it, "alimentary levulose hyperglykemia."

After 100 grams of levulose, normal individuals show a blood-content of 0.1 per cent., 0.17 per cent., without a corresponding levulosuria. An analogy has already been found in the production of a hyperglykemia after glucose, but without glycosuria. In cases of hepatic disease, levulosemia was always seen, but there was not a constant parallel between the amounts in the blood and the amounts in the urine. Schvokauer believes there is a renal factor, which is not generally taken into consideration, even when the organ is healthy, and when the kidney is diseased the effect is even more noticeable. It would be of the utmost value to have parallel studies made between the amount of levulose (or galactose) in the blood and urine, on the one hand, and reliable renal functional tests on the other.

(b) *Alimentary Galactosuria.* Last year (PROGRESSIVE MEDICINE, p. 108) I devoted considerable space to the discussion of galactosuria as a test of functional disturbance of the liver. Since then several important papers have been written having as the underlying themes, an attempt to make comparative studies of the excretion of galactose and levulose and, in some cases, dextrose in hepatic disease.

Strauss,² who, it will be remembered, was the first to recommend the use of levulose for such purposes, still holds to his faith in that test, despite the assertions of others that it is far inferior to galactose. Strauss affirms the opposite, however, as he has found (in a limited series, to be sure) that levulosuria is much more dependable and is in fact more sensitive a test than galactosuria.

Wörner and Reiss³ have not rested content with qualitative tests either for galactose or levulose but believe quantitative tests of both are alone of value. After 40 grams of galactose, urinary amounts of 3 grams or above are considered pathological, and after 100 grams of levulose the excretion must exceed 0.7 gram before one can say there is a diminished tolerance for levulose. The authors were hopeful that by a combination of both methods they might find a test useful in differentiating the various diseases of the liver, but their work has failed to realize this ambition. They did find, however, that galactose is excreted constantly in only a certain variety of hepatic disorders, catarrhal icterus, phosphor poisoning, fatty liver; while in other diseases—cirrhosis and syphilis—the reactions were variable, and in mechanical obstruction of the common duct—carcinoma, gall-stones—the test was negative. Alimentary levulosuria, on the other hand, is present, in liver injury *sui generis*, irrespective of the lesion.

Tests made with dextrose, levulose, and galactose by Wagner⁴ indicate that dextrosuria is valueless as a functional test, levulosuria is of value,

¹ Zeitsch. f. kl. Med., 1913, lxxviii, p. 462.

² Ibid., 1914, p. 907.

³ Deut. med. Woch., 1913, p. 1780.

⁴ Zeitsch. f. kl. Med., 1914, lxxx, p. 174.

but is far inferior to galactose. The author takes exception to Straus' view quoted above, and says that levulose has a decided disadvantage inasmuch as there are often gastro-intestinal upsets following its use, particularly in cases of cirrhosis. Wagner hints at future work, showing that a combination of galactose with beef extract (Liebig) makes the test more sensitive than when galactose is given alone.

Hartiegen¹ believes a positive test depends a good deal on the presence of icterus, as all cases with icterus have a diminished tolerance. It is questioned whether with icterus there is not a general degeneration of the liver. However, severe cases of hepatic cirrhosis fail to give the test, so that this explanation is not all sufficing.

Maliwa,² in one case of severe icterus, found only the physiologic amounts of galactose after administering the usual quantity (40 grams). He suggests that the kidneys play an important role, together with the liver. The latter is responsible for the concentration of galactose in the blood, and, when diseased, there is an increased amount, too much for the kidneys to hold back. If the liver is healthy and the kidneys are diseased, the concentration, although normal, is too great for the diseased kidneys and galactose appears in the urine. In other words, alimentary galactosuria can in no sense be considered as an unequivocal sign of hepatic disease.

Whipple and his co-workers, have been devoting their energies to the study of those tests which may be of value in the study of pathologic changes in the liver. Much, in fact most, of their work has been experimental, that is, the liver changes have been produced artificially in animals and the tests have been applied in these conditions.

The tests which have been most closely studied and which may have a clinical bearing are lipase, fibrinogen, and phenoltetrachlorphthalein.

(c) *Lipase.* In normal animals or human beings this ferment can be shown to be present in the blood-plasma or serum, in a pretty constant amount. The method is as follows: Four tubes are prepared; each containing 1 c.c. of plasma or serum diluted with 4 c.c. of distilled water and 0.3 c.c. of toluol. To two of the tubes is added 0.26 c.c. of ethyl butyrate, reserving the other two tubes as controls. The tubes are shaken, corked and placed in an incubator at 38° C. for eighteen to twenty-four hours. They are then chilled in iced water, three drops of azolitmin added as an indicator, and the tubes titrated in pairs to a neutral reaction, using one-tenth normal acid and alkali. The two control tubes show the blood-alkalinity to be 0.1 c.c. of one-tenth normal acid and the butyrate tubes show the acid production to 0.1 to 0.2 c.c. above the neutral point. This means that the total lipolytic activity is 0.2 to 0.3 c.c. one-tenth normal solution, that the lipase of the plasma has split up the ethyl butyrate to this extent. One may thus speak of a normal plasma lipase as 0.2 to 0.3 c.c., speaking, of course, in terms of

¹ Wien. kl. Woch., 1914, p. 358.

² Ibid., p. 762.

one-tenth normal acid. When the ferment increases five or eight times to the normal, the presence of acute liver injury is certain. It does not, however, give an accurate idea of the amount of injury, although a grave injury will show a higher liptose reading than a moderate injury. The test is of qualitative value rather than of quantitative worth, and is of importance in suspected eclampsia, chloroform poisoning, yellow atrophy, cholangitis, etc.

(d) *Fibrinogen* is normally present in blood-plasma and amounts to 300 to 400 grams per 100 c.c. in human beings. A rough estimation of the fibrinogen is possible by causing a little oxalate plasma to clot on ruddy calcium. The toughness of the clot indicates in a general way the amount of fibrinogen. In certain cases of hepatic cirrhosis, the fibrinogen content may be very low, dropping to 0.05 grams or even less. This is not an invariable finding, but, when present, is always of grave prognostic significance.

(e) *Phenoltetrachlorphthalein* (Phthalein). Whipple and his associates have shown that this drug, when given intravenously and the collected in the feces and urine, can give important evidence concerning the amount of liver injury and the degree of functional impairment. After an acute injury there is an immediate drop in liver phthalein output in the feces, this drop corresponding very closely to the degree of injury, falling to zero in the fatal cases. The phthalein which does not appear in the urine of a normal dog, comes through very promptly in the urine after a liver injury is established. As the latter is repaired, the curve of phthalein output in the feces will rise to normal and the urine output sinks to zero. I omit a description of the method, as a modification suitable for clinical purposes will be detailed below.

In dogs, the normal output is between 40 and 50 per cent. The drop in phthalein output appears to run parallel with the amount of parenchyma injury, and, after repair, the output may rise above normal. The papers from which these abstracts have been made are by Whipple, Mason, and Peightal,¹ Whipple and Whipple,² Peightal and Clark.³

Clinical application of the test has been made by Rowntree, Hurwitz and Bloomfield.⁴ 2.5 grams of phthalein are placed in a 200 c.c. Erlenmayer flask with 5 c.c. of $\frac{2}{n}$ NaOH and 45 c.c. of freshly distilled water. This is boiled for twenty minutes with a condenser, the solution is filtered into a 100 c.c. flask, when it is ready for use. 8 c.c. of this solution, approximately 400 mg. of phthalein, are administered intravenously by gravity under strict antiseptic and aseptic precautions. Active purgation is instituted prior to administration of the dye and throughout the time of observation, usually by means of compound cathartic pills. The stools are collected for forty-eight hours, the urine for twenty-four hours. In the event of little or no feces being obtained, enemata are

¹ Johns Hopkins Hospital Bulletin, July, 1913.

³ Ibid., November.

² Ibid., November.

⁴ Ibid., November.

used, but unless the normal amount of the dye is recovered, the test must be discarded, since low findings under these conditions are not acceptable.

The total forty-eight-hour feces are placed in a 2-liter bottle and diluted with water to 1 or 1.5 liter, depending on their amount. This is placed in a shaking machine for from five to twenty minutes. Without allowing time for sedimentation, one-tenth of the total is placed in a 1-liter flask and 5 c.c. of 40 per cent. NaOH solution are added, and the whole diluted with water to 1-liter. A stopper is inserted and the mixture thoroughly shaken, 100 c.c. are placed in a 200 c.c. flask, 5 c.c. saturated basic lead acetate added, and then 5 c.c. of NaOH. The contents of the flask are made up to 200 c.c., shaken, and a small part filtered off and the amount determined by the Rowntree and Geraghty modification of the Autenrieth Königsberger colorimeter with a 20 mg. to 1 solution of disodium salt of tetrachlorphthalein.

Collection of the feces for forty-eight hours is an objectionable feature of the method, as it is a difficult matter to have this done accurately and with quantitative precision. The authors have found a constant decrease in liver disease and believe the test may have some application in the clinic.

(f) *Estimation of Amino-acids as a Test for Hepatic Insufficiency.* Sometime since, it was shown that, in health, the output of amino-acids in the urine did not exceed 35 mgs. in the twenty-four hours, the proportion to total nitrogen being AN : TN : : 3.5 : 100, whereas in liver disease, as much as 1 gram is seen, and AN : TN : : 12 : 100. Labb   and Bith¹ regard amino-aciduria as a significant sign of hepatic insufficiency. Curiously enough, the test does not indicate alcoholic cirrhosis, but is positive in cirrhosis due to tuberculosis. The authors believe that it is only in those cases where the liver cells are materially affected, where lesions of the liver exist, that the amino-acid functions of the liver are interfered with. Such cases, they say, are cancer tuberculous cirrhosis and the advanced grades of alcoholic cirrhosis.

Their method consists, not in giving glycool, as suggested first by Glaessner, as it is too expensive, but in administering pepton (20 grams) after a day or so of strict milk or vegetable diet. It is claimed there is an increase in the total amount of amino-acids excreted, with increase of the amino-total-nitrogen ratio. To me, the results obtained seem equivocal as cases M. G. and M. V. will show:

		AN	AN : TN
M. G. Tuberculous cirrhosis:			
January 10. Vegetable diet	0.74	11.2	p. 100
January 11. Vegetable diet pepton (20 gr.)	0.34	16.2	p. 100
January 12. Vegetable diet	0.30	10.0	p. 100
M. V. Tuberculous cirrhosis:			
January 17. Vegetable diet	0.50	0.5	p. 100
January 21. Vegetable diet pepton (10 gr.)	0.60	11.0	p. 100
January 22. Vegetable diet	0.45	7.0	p. 100

¹ Rev. de M  d., 1914, p. 89.

(g) *Abderhalden Test.* An attempt has been made by Hertz and Brokman¹ to make use of the Abderhalden method for the diagnostication of hepatic disease. This attempt can not be said to have resulted very favorably, and seems to promise but little.

EXPERIMENTAL PRODUCTION OF CIRRHOSIS OF THE LIVER. Turning ever to the subject of the effect of alcohol on hepatic changes, we find authors year after year offering their results supporting the accepted view that alcohol does injure the liver. Among those who entered the field last year we may mention Isobe² and Grover.³ Lissauer, who has made notable studies, contributes a lengthy and painstaking review in the *Berliner medizinische Wochenschrift*, 1914, pages 114 and 159.

MEDICAL TREATMENT OF CIRRHOSIS OF THE LIVER. Davis⁴ makes a plea to internists to abandon the hopeless view of the inefficiency of medical treatment, claiming that much has been accomplished in his patients by the use of a pure milk diet. He gives six glasses of milk a day, and confines the patient to bed. This generous salt-poor diet is a liberal allowance. I have used the strict Karel diet with much benefit, that is, 200 c.c. of milk four times a day. Often dry toast or toast with salt-free butter must be added to satisfy the insistent clamor for food, which is soon heard when there is improvement. Davis allows, after the edema has decreased (I would suggest in hospital practice that daily weighings of the patient be made), corn-starch, sago pudding, blancmange, and later a little bread. When the edema is gone and the ascites nearly gone, eggs without salt are prescribed. Milk diet should be maintained for at least six months after the ascites and edema have disappeared. As far as drugs are concerned, elaterium was used in $\frac{1}{4}$ -grain doses for constipation, and hexamethylenamin empirically, as it can scarcely be seen how its use can be productive of much benefit. No mention is made of autoserotherapy, a measure which, in the experience of some, is of value, but which, in my hands, has been productive of no good results.

Einhorn⁵ suggests the use of his duodenal tube for the introduction of aliment, his suggestion being based on the following considerations: The function of the liver is to act as a sort of control for substances brought to it before they enter the general circulation. This is brought about by the great network of the portal vein. The latter collects the blood from the digestive organs and distributes it for further separation to the various parts of the liver. If the liver is diseased, the function of preparing the portal blood for the vena cava is interfered with and deleterious substances enter the circulation, or the circulation is so delayed

¹ Wien. kl. Woch., 1913, p. 2033.

² Mitt. a. d. Grenzgeb. d. Med. und Chir., 1914, xxvii, p. 750.

³ Journal American Medical Association, 1913, lxi, p. 458.

⁴ Ibid., p. 273.

⁵ Berl. kl. Woch., 1913, p. 711.

in the liver that there is local congestion with hepatic enlargement. By using duodenal alimentation, the upper part of the digestive tract is excluded from participation in digestion, and the portal vein is relieved of a part of the blood brought to it and the work of the liver is made easier. With this method, Einhorn claims to have seen a material reduction in the size of the liver, and a great improvement in the patient's general condition. Unfortunately, details of the method are lacking in this article.

Acute Congestion of the Liver. Three cases of this condition, furnish the basis of an interesting communication by Ortner.¹ I reprint the history of one of the cases which illustrates the history of the other two cases: The patient, a soldier, aged fifty-two years, stated that until recently he had been perfectly well, but that lately he has had trouble whenever he did any amount of physical work. He became much more tired than formerly, and had oppression about the heart. Although he was aware that there was something wrong, he undertook to do a hard piece of mountain-climbing. Going up and coming down he was free of symptoms, but on the way home he began to have pain in the epigastrium, and behind the sternum, which pain seemed to radiate upward. Within a half-hour the pain was intense, he was very dyspneic, and, on reaching home, he went immediately to bed, where he had to assume a sitting posture. Rest in bed brought about a cure. Apart from a moderate amount of cardiac dilatation, due to myocardial degeneration, there was nothing of note in the man's physical condition.

A few weeks after seeing this patient, Ortner had occasion to examine a similar case, with similar symptoms following a mountain-climbing expedition, who exhibited an enormous liver, which was extremely tender when percussion was practised. The first case was wrongly diagnosed, but this case was so typical that Ortner had no hesitancy about it being acute congestion of the liver (*perakute stauungsleber*). He induced his first patient to repeat his mountain trip, explaining to him his object, and, following the experiment, the same symptoms, plus a large and very tender liver made their appearance. A third case was subsequently seen.

Ortner believes that there is primarily a failure of the right heart, and that the liver enlarges in order to compensate for the cardiac inefficiency, much as it does in tricuspid insufficiency, acting much in the same way as venesection does in heart disease.

Acute Hepatitis. In the *Deutsches Archiv. f. klinische Medizin*, 1912, 108, attention was called by Schultze to a case of acute hepatitis, which was wrongly diagnosed abscess of the liver, and an operation was advised. The chief symptoms were acute onset, fever, pain, and great painful enlargement of the liver without icterus. Bittorf² reports a similar case in which the diagnosis was correctly made (leukocytes 8000) and which yielded promptly to salicylic acid. The cause was thought to be the

¹ Med. Klin., 1913, ci, p. 1525.

² Ibid., p. 566.

B. typhosus, as the patient was a typhoid carrier. Bittorf believes that the condition is really a cholangitis, and claims that the absence of icterus is no contradiction to this view.

X-ray of the Liver. The liver is held by most röntgenologists to be beyond the reach of a clear *x*-ray examination. The reason for this belief is that certain abdominal viscera have the same absorption coefficient—collapsed bowel, omentum, liver—making sharp differentiation impossible. When there is air in the abdomen, conditions are different, as the air space absorbs the rays more weakly than the surrounding tissue and there results a difference in shadow which is more marked the nearer the organs and air space are to the screen. Meyer-Betz¹ has utilized this observation for the *x*-ray study of the liver.



FIG. 24.—*A*, liver; *B*, spleen.

He uses the fluoroscope by preference, and fills the intestines with air by means of a rectal tube and atomizer bulb. This is not as simple as it would seem, and it is necessary to use palpation, whereby certain impinging parts of the intestinal tract are removed from contact with the liver or brought into a more nearly normal relationship with it. Examinations are made with the patient standing and with him recumbent. Technical details of the position of the tube, etc., are elucidated.

The lower edge of the normal liver bisects the edge of the ribs or extends slightly beyond, and the left lobe reaches a little beyond the shadow of the vertebral column. Although the gall-bladder cannot be detected its position is indicated by the angulation of the shadow (Fig. 24).

¹ Münch. med. Woch., 1914, p. 810.

If the inflation is continued to a marked degree, the liver changes its position in two ways. More frequently it turns on its sagittal axis, the



FIG. 25.—*A*, liver; *B*, heart; *C*, spleen; *D*, stomach.



FIG. 26.—*B*, liver.

edge of the right side falls and its shadow reaches to, or extends beyond, the spine of the ileum (Fig. 25). At the same time, the left lobe drops a little so that the liver form has the appearance of an equilateral rectangular triangle, the apex being at the diaphragm, and the base running from the heart shadow to the ileum. Or, a second change of shape is brought about by a lifting of the anterior border, making the lower surface of the liver horizontal (Fig. 26).

The practical results to be obtained from röntgenographic studies of the liver would seem to be in cases of "floating" liver or hepatoptosis, and those cases of Riedel lobe, always confusing, on account of their resemblance to an abdominal tumor.

In cases of ascites, Meyer Betz recommends paracentesis abdominis followed by injection of oxygen into the peritoneal cavity.

Just a week before, Löffler¹ had recommended the use of colonic inflation, using instead of air, oxygen or nitrogen. This method is not so simple as that of Meyer Betz's, besides being much more expensive.

Icterus. Although the general conception of the term icterus, is that "condition with visible biliary discoloration of the eyes and skin," Hymans, Bergh, and Snapper² regard the definition as incomplete, and prefer to regard icterus as "that condition with which there is an abnormal amount of bile pigments in the circulating blood." Every normal blood contains some bilirubin; at times the amount is great enough to color the serum a light yellow and at times there are but traces. The figures given by the authors range from $\frac{1}{800000}$ to $\frac{1}{400000}$. (For technique of estimation of bilirubin see article by the same writers in the *Deutsches Archives f. klinische Medizin*, ex, p. 540.)

In many diseases there is no variation in the amount of bilirubin from the normal; especially is this striking in certain conditions where one would expect, *a priori*, to find an increase, notably in echinococcus, carcinoma, atrophic and hypertrophic (Hanot's) cirrhosis. In one case of cirrhosis there was intense icterus, the blood-bilirubin was normal, and this is explained by assuming the absence of bile from the blood with retention by the tissues.

Myocardial insufficiency, no matter the cause, is always associated with high values, and the authors regard a bilirubinemia as a fine test for decompensation. Pneumonia and certain anemias, particularly progressive pernicious anemia, have hyperbilirubinemia. Hemolytic icterus has always increased amounts, while phthisis, contracted kidneys, and malignancy have low values. Hymans, Bergh, and Snapper believe there is a threshold (schwellenwert) for bilirubin, in the kidneys, and that only when the amounts exceed $\frac{1}{500000}$ to $\frac{1}{600000}$ can this threshold be passed. Amounts below this are turned back.

They have endeavored to show that bilirubinemia is dependent to a great extent on local hemorrhages, although they do not state where the

¹ Münch. med. Woch., 1914, p. 763

² Berl. kl. Woch., 1914, pp. 1109 and 1180.

local hemorrhages occur in the diseases studied above. Their conception of the pathology of icterus is as follows: As soon as blood leaves the vessels and gets into the tissues there is a local manufacture of bile pigment. This has often been observed in subcutaneous and in subconjunctival extravasations. This pigment is then taken off by the blood, and when it exceeds the threshold limit of the liver, the pigment is excreted in the bile passages. A certain amount is not excreted, however, but is retained in the blood, and when there is myocardial disease, with secondary degeneration of the liver cells, this retention is greater, and then the kidney threshold is crossed and bilirubin appears in the urine.

The authors state in the beginning of the paper "the explanation (of icterus) is easy when there is mechanical obstruction of the bile," and one supposes that they mean, that, having no other means of exit, the bile must enter the blood-stream. This is not so stated, but I assume this to be their explanation. Riedel¹ admits that this may be one cause of the icterus, but insists that most common duct-stone cases are infected, and that inflammation of the gall-ducts is the major cause. The mechanical factor is almost negligible, and if it plays any role it enacts its part for only a brief space of time, whereas inflammatory changes in the gall-ducts and extending to the liver parenchyma are the principal cause of icterus in cholelithiasis.

DUODENAL JUICE IN ICTERUS. There seems to be a hypersecretion of the duodenal juice in the icterus, according to Matko,² being more marked at the height of the jaundice, and *vice versa*.

Cholelithiasis. Pathogenesis of Cholelithiasis. The study of cholesterin in the economy of the body is receiving more and more attention, and the application of these studies to the explanation of cholelithiasis seems near at hand. Formerly there were two theories concerning the production of gall-stones: (1) the humoral theory, which explains the trouble as the basis of disturbed metabolism, on a diathesis so to speak, and (2) the infectious theory, which ascribes the gall-stone formation to a local trouble, bacterial in origin.

Naunyn is largely responsible for the second theory, the rationale of which may be stated as follows: There is first a biliary stasis caused by some mechanical factor, the stasis provoking a secondary infection of the gall-bladder, which, in turn, causes the mucosa to secrete increased amounts of mucus, which precipitates the lime salts, pigment, and a certain amount of cholesterin, these forming a nidus for the subsequent deposit of cholesterin and lime.

Since Naunyn's time, this theory has been violently assailed, the attack being led by Chauffard, assisted by papers from Aschoff and Bäumeister, which all tend to develop the idea that infection alone is not responsible, but that there is a sterile form of gall-stone whose origin must

¹ Deut. med. Woch., 1914, p. 841.

² Ibid., 1913, p. 1723.

be ascribed to a faulty metabolism. Formerly it was held that cholesterol was not dependent on the quality or quantity of the food ingested, but some years ago this was disproved by some work which I did in Hofmeister's laboratory, and whose principal value lay in the discovery that food rich in protein augmented the quantity of cholesterol in the bile. This fact has been corroborated so frequently that it may be regarded as a fundamental truth of extreme importance.

Studies of the cholesterol of the bile and of the blood lead one to assume more and more that hypercholesterinemia and gall-stones are closely related with biliary stasis playing a contributing role.

Flaudin¹ sums up the subject very tersely, and I append his conclusion.

1. The development of gall-stones may be ascribed to the following causes: (a) Under the influence of traumatism, infection, stasis, hemolysis, there is a deposit of pigment in the gall-bladder, which later becomes organized into a gall-stone. (b) Calculi form when there is biliary stasis combined with hypercholesterinemia, and a tendency toward a local deposit of cholesterol.

2. Certain humoral influences and changes play a part, and the blood-serum contributes its share when there is hypercholesterinemia or cholemia or both.

The fact that cholesterol enters so largely into the composition of gall-stones, the fact that cholelithiasis develops so frequently in pregnant women and in those overfed, of sedentary habits, or in those with visceroptosis, increases the importance of biliary stasis and a high cholesterol content of the blood. Pregnancy, fatty or nitrogenous food, increased cholesterol, and pregnancy, sedentary habits, and stasis offer mechanical obstacles to the outflow of bile.

4. Hypercholesterinemia alone cannot be the sole cause, any more than infection alone or biliary stasis, as nephritis, who have increased amounts of cholesterol, are seldom affected with gall-stones.

5. Two factors are probably responsible: (a) Augmentation in the organism of a lithogenous substance (cholesterol), and (b) local stasis, infection, or a disturbed colloidal equilibrium of the substances in solution in the bile.

6. The conception of hypercholesterinemia may well explain the recurrence of gall-stones, a question which demands the work of many years.

Biscons and Rouzaud² have studied the cholesterol content of the blood of hepatic and gall-bladder patients, and claims to have found a marked decrease after twenty days of a vichy "cure."

The reader's attention is directed to a complete and carefully considered study of cholesterol metabolism by Gregaut in his *Paris thesis* for 1913. The work is too lengthy to permit of an abstract for PROGRES-

¹ Arch. des mal. de l'App. Dig., 1913, vii, p. 255.

² Rev. de Méd., 1913, xxxiii, p. 493.

SIVE MEDICINE, but should be read *in toto* by those interested in the subject.

GALL-STONES AND GASTRIC SECRETION. Chemically there is a definite relationship between cholelithiasis and functional disturbance of the stomach, this disturbance being considered to be in the nature of hyperacidity. V. Aldor¹ has made a study of the effect of gall-stones on gastric chemistry in eighty-two patients to whom, repeatedly, test meals were given. His results I have grouped in a table:

15 cases	18.0 per cent.	Normal acidity.
32 cases	39.0 per cent.	Hyperacidity.
35 cases	42.6 per cent.	Sub- and anacidity. (24 subacidity, 11 anacidity.)

This finding of a high percentage of subacidity values in gall-stones agrees somewhat with Hohlweg's figure of 71 to 84 per cent., but is at variance with the view generally held, namely, that hyperacidity is the rule. A critical analysis of v. Aldor's cases reveals the fact that those cases which have lowered acidity are the ones with a chronic course, with evidence of gall-bladder infection, and subsequent pathological changes in the gall-bladder. Those cases with hyperacidity, on the other hand, are generally the ones of short standing in which there is no demonstrable lesion of the gall-bladder itself. In other words, subacidity points to gall-stones and gall-bladder disease, while hyperacidity indicates gall-stones *per se*.

EFFECT OF FOREIGN BODIES IN GALL-BLADDER ON GASTRIC SECRETION. Lichty, it will be remembered, introduced foreign bodies into the gall-bladders of dogs, and concluded therefrom that (1) a lesion of the gall-bladder and ducts may disturb the gastric function; (2) this disturbance most frequently consists of a hypersecretion of gastric juice and a diminution of gastric motility; (3) so-called hyperchlorhydria, with its accompanying symptoms, should be looked upon as an evidence of some definite pathological lesion somewhere in the gastro-intestinal tract or its appendages.

Pepper² has repeated this work, controlling possible sources of error which to him seem to invalidate Lichty's conclusions. The results are not in accord, Pepper finding no change in the gastric secretion or digestion, or in the morphology of the stomach or pancreas, within a period of eleven months after the introduction of a foreign body into the gall-bladder.

INTRAHEPATIC GALL-STONES. Siber³ reports a case of primary gall-stone formation in the liver which had led to the development of an hepatic abscess. At operation, undertaken for this latter condition,

¹ Wien. kl. Woch., 1914, No. 18.

² American Journal Medical Sciences, 1913, cxlv, p. 220.

³ Berl. kl. Woch., 1914, p. 18.

fifty-one stones were found in the liver, while the gall-bladder was uninvolved.

Courvoisier and Beer were the first to describe intrahepatic gall-stone, but they considered that they had wandered from the gall-bladder to the hepatic ducts. This unusual case of Siber's seems to be a refutal of this idea.

X-RAY DIAGNOSIS OF GALL-STONES. The following difficulties are encountered in the diagnosis of gall-stones, according to Pfahler:¹

1. Their density differs little from the surrounding bile, therefore if there is much bile in the gall-bladder, detection is more difficult. The more calcium salt in the composition of the stones, the more easily are they seen, and when the calculi are in the common duct they are more easily shown because of less surrounding bile.

2. Pure cholesterol stones can sometimes be recognized by their increased translucency as compared with the liver, and especially is this true if they are covered with a deposit of lime. In stout people there is great difficulty, as the small shadow of the stone must be differentiated from the shadow cast by a great mass of soft tissue.

3. On account of the faint differentiation of the shadow of a gall-stone, it is necessary to have the liver and gall-bladder absolutely still, which is accomplished by having the individual hold his breadth and by applying as much compression as possible.

4. The question of over- or under-exposure is an important one, as either will entirely obliterate the shadow even when the stones are laid on the plate.

5. The shadow of gall-stones must be differentiated from that cast by calcified costal cartilages, renal calculus, and fragments of bismuth, pills, or other substances in the stomach or bowel.

Both Case² and Pfahler are convinced that gall-stones may be demonstrated by the *x*-rays in 50 per cent. of the cases.

Cole³ believes the main difficulty in diagnosing gall-stones lies in the differentiation between these and renal calculi. He gives technical details as to where and how to place the plate, and also a mathematical formula and equation for locating the disturbance of the calculus from the anterior abdominal wall.

"Indirect evidence of gall-stones, or rather of an accompanying cholecystitis, as presented by adhesions involving the stomach, cap, duodenum or hepatic flexure, is of more clinical value than the detection of the gall-stones themselves, because the adhesions represent an accompanying infection, requiring surgical intervention, while a gall-stone without infection may remain in the gall-bladder indefinitely without causing symptoms.

¹ Journal American Medical Association, 1914, lxii, p. 1304.

² Ibid., 1913, lxi, p. 920.

³ Surgery, Gynecology, and Obstetrics, February, 1914, p. 218.

"In conclusion, I would state that gall-stones may be detected sufficiently often to justify a röntgenographic search for them, but the absence of any direct evidence does not justify one in making a negative diagnosis, and should not prevent surgical intervention, provided it is clearly indicated by the history.

"Above all, I plead for a differential diagnosis between right renal calculi and gall-stones."

SOLUBILITY OF GALL-STONES. Discussion of the treatment of cholelithiasis has been purposely omitted, as there has been no new light thrown on the subject during the past year. In PROGRESSIVE MEDICINE for December, 1913, page 118, I made a short note on the solubility of gall-stones, as exhibited in the work of v. Hansemann. The latter showed some loss of weight of artificially introduced gall-stones in dogs, a fact which has great significance.

Leo¹ has followed up this suggestion, and has studied the effect of Carlsbad water on the solubility of biliary calculi.

	Loss in 21 days.	Daily loss.
Control dog	0.383	0.018
Carlsbad water	0.453	0.0216
Alkaline chlorid water	0.356	0.017

Thus it would seem that the Carlsbad water has a dissolving action on gall-stones; at any rate, this seems to be so in the experimental animal. It is of course apparent that one cannot apply these results too literally to man, as artificially introduced gall-stones are not comparable to those which arise spontaneously. In the latter case we have to deal, as I have said above, with a disordered metabolism of cholesterol, hypercholesterolemia, which is presumably not present in the normal experimental dog.

Nevertheless the researches of v. Hausemann and of Leo have a definite purpose and should stimulate more illuminating work in the future.

HAS REMOVAL OF THE GALL-BLADDER ANY DELETERIOUS EFFECTS? The question whether the gall-bladder should be removed when but slightly diseased or when gall-stones are present is one which has as yet not been definitely answered by surgeons. Strangely enough, it is frequently to the internist that such a question is put by the operator. Personally, I feel that surgeons are more and more inclining toward cholecystectomy and are abandoning the simple cholecystotomy, meaning, of course, in uncomplicated cases. If this is the present attitude of our surgical colleagues, it is incumbent upon them, and no less upon the internist, to understand fully the functions of the gall-bladder and to comprehend what changes, if any, in digestion follow its removal. Rost,² a surgeon, frankly admits that before an organ is sacrificed routinely, as is the gall-bladder in some hands, its place in the economy of the body should be appreciated, and one should be certain that he is not causing irreparable damage to digestion and metabolism by a cholecystectomy.

¹ Deut. med. Woch., 1914, p. 986.

² Mitt. a. d. Grenzgeb., 1913, xxvi, p. 710.

The fact that extirpation is frequently followed by vomiting, belching, gastric oppression, constipation, and other digestive symptoms is a sign that removal of the gall-bladder has had some influence on intestinal functions. That adhesions are not the cause is shown by the fact that the above symptoms are seen in 16 per cent. of cholecystotomies and in 27 per cent. cholecystectomies. Also the fact that pure aseptic gall-stones cause the same symptoms indicate that the complete removal of the organ is not without some effect.

The main lesson learned from Rost's work is that, although, bile at first, and for some time, drops into the duodenum, eventually there comes an intermittent emptying, just as happens when the gall-bladder is intact. Another important fact deduced is, that after cholecystectomy the bile passages dilate, and in reality act as a gall-bladder, inasmuch as bile is retained in them; in other words, a new gall-bladder, in function at least, is established.

As far as the normal function of the gall-bladder is concerned, the outpouring of bile seems to be dependent on certain stimuli. The psychic factor of eating causes a flow of bile to take place within one to three minutes after taking food. The amount of bile thus secreted (psychic secretion) varies (from 4 to 5 c.c. to 14 c.c.). Another stimulus is furnished by the discharge of food into the intestine. The amount thus obtained is very large and is doubtless dependent upon the composition of the gastric contents. Certain substances also act as stimuli, and of these, peptone is the strongest and fat is next.

The fact that the bile mechanism is so dependent on the various stimuli cited above, leads one to conclude that the emptying of bile into the bowel is under the control of an extremely fine reflex nervous mechanism, the anatomic factors being the smooth muscle of the gall-bladder, bile ducts, and sphincter of the duodenal papilla, which may be made to relax and contract with various agents.

After reading Rost's article, supplemented by an engaging paper by Klee and Klüpfel,¹ one is forced to conclude that a cholecystectomy must have some influence on the reflex mechanism of biliary excretion, and must interfere to a certain extent with the discharge of bile. In some cases this is but transitory, and the gall-bladder may be compensated for by dilatation of the bile ducts. In other cases, however, there is no regulation of the bile mechanism, and bile continues to drop into the duodenum in an inconsequential manner. Just what effect on digestion this unregulated flow has is not stated. There seems to be no disturbance of metabolism following cholecystectomy.

So much from the stand-point of bile. What about the effect of cholecystectomy on gastric secretion? This has already been answered in part by Hohlweg a couple of years ago, who found that when there

¹ Mitt. a. d. Grenzgeb., 1914, xxvii, p. 785.

was normal bile secretion there was hypersecretion and hyperchlorhydria, and when it flowed continuously into the duodenum, as we have learned it does sometimes, the effect is to diminish the secretion of hydrochloric acid. In 42 patients after cholecystectomy, 69 per cent. had absence of HCl, 16.6 per cent. normal values, and in the remainder (6 cases), hypo-acidity.

Mangus,¹ accepting as probable that the bile after removal of the gall-bladder flows continuously (a conclusion unwarranted if we credit the work of Rost, cited above), has studied the subject by giving a test meal after operation, and disagrees emphatically with Hohlweg. Magnus, it may be said, is a surgeon, and Hohlweg an internist, and it almost seems as if the surgeons and physicians were irrevocably asunder on the advantages and disadvantages of a cholecystectomy, for we have found Rost *versus* Klee and Klüpfel, and now we have Magnus *versus* Hohlweg. It is most strange to see such diametrically opposite results obtained by men of different beliefs. One is almost inclined to paraphrase the familiar quotation and say: "The wish is father to the conclusion."

An extremely radical view, namely, "Treat all gall-bladders routinely in operation as one treats the appendix, that is, removal," is advanced by Lecène.²

UROBILIN. The most prominent of the various theories as to the origin of urobilin are the hematogenous, the hepatogenous, the nephrogenous, the histogenic, and the enterogenous, and in brief these theories are described as follows by Wilbur and Addis:³

"*Hematogenous Theory.* This theory is, that the urobilin can be, but is not necessarily, derived directly from blood-pigment. It is based on the somewhat uncertain evidence of the long-known occurrence of urobilinuria in hemorrhage of the brain, in blood-extravasations in extra-uterine pregnancy, in hemorrhagic ascites, after hemocytolytic processes, in sulphonal poisoning, in paroxysmal hemoglobinuria, and in scurvy. While it is true that there is this possibility in many of these reported clinical observations of the existence of definite hepatic disturbance, still there is enough experimental evidence to warrant the assertion that at times urobilin can be derived directly from blood-pigment without the intervention of either the liver or the intestine.

"*Hepatogenous Theory.* The principal tenet of this unsatisfactory theory is, that there is failure on the part of the liver in its normal decomposition of hemoglobin, and that, as a result of this insufficiency, urobilin is formed and reaches the kidney through the blood-stream, and is there eliminated, or is added to the intestinal contents by the bile. A somewhat strict interpretation of this theory is, that there is a direct formation of urobilin within the liver cell, or at least within the bile passages from the bile pigment.

¹ Med. Klin., 1913, p. 1078.

² La Presse Méd., 1913, p. 994.

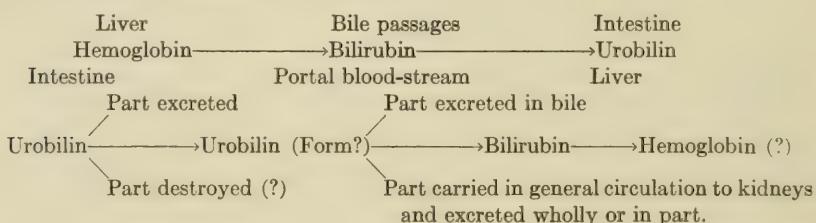
³ Arch. Int. Med., 1914, xiii, p. 235.

"Nephrogenous Theory. In brief, this is based on the fact that urobilin as such is very rarely found in the blood, and that it reaches the kidney in the form of bilirubin, which is reduced to urobilinogen in its passage through the renal epithelium. Herscher states that kidney substance can reduce bilirubin, but surviving kidneys with bilirubin circulating in their blood, secrete no urobilinogen but only bilirubin in the collected urine. The principal argument against this theory is that urobilin does not occur in many cases of jaundice.

"Histogenic Theory. This theory that hemoglobin or bile pigments are reduced in the tissues to urobilin and then reabsorbed and eliminated, offers an insufficient explanation of the various known phenomena.

"Enterogenous Theory. While not meeting all conditions, this theory is based on the explanation of the established facts of urobilin formation. In brief, it is based on the finding that bile pigment reaching the intestinal lumen, undergoes a change into urobilinogen and urobilin caused by bacterial decomposition. It may then be absorbed into the capillaries of the portal system and so reach the liver parenchyma. If the liver is normal, the major portion of the urobilin is broken up or synthesized to bile or blood-pigment. A portion may be secreted in the bile and so be returned to the intestinal lumen to be reabsorbed or passed off with the stool. When the liver parenchyma is damaged these changes in the urobilin may not take place, but it passes on into the general circulation. It reaches the kidney through the blood or is eliminated in the urine. This theory is principally sustained by the absence of urobilin in the urine in any quantity in cases of obstruction of the common duct."

This last-named theory represents the usual mode of origin of urobilin, although there is evidence that the diseased liver may originate urobilin either directly as a product of its cells or indirectly from decomposition of bilirubin within the bile passages. A schematic representation is given by Wilbur and Addis:



This scheme assumes that there is a breaking down of bilirubin to urobilin in the intestine, with synthesis of the absorbed urobilin in the liver to bilirubin and perhaps by a reverse action again to hemoglobin.

Studies of urobilin in the stools indicate that there is an increased quantity when there is increased blood-destruction. There is a close association between urobilinuria and disturbance of liver function, and is seen particularly in cases of hepatic cirrhosis.

In hepatic stasis increase of urobilinuria is of ominous prognostic sig-

nificance in cardiac decompensation. Obstructive jaundice is not accompanied by urobilinuria, although the latter is seen in cases of icterus when the jaundice is due to increased destruction of red-blood cells as in chloroform poisoning, acute yellow atrophy and similar conditions.

The authors claim that by means of urobilin estimations in the stools and urine, certain anemias may be differentiated. Thus they found a large total urobilin elimination in cases of pernicious anemia, but small amounts in secondary anemias following hemorrhage or carcinoma.

Value of Quantitative Urobilin Estimations in the Feces. Similar results were obtained by Eppinger and Charnas¹ in a work which is essentially clinical. They also have found high values in anemias with blood-destruction as opposed to low values in cases of secondary anemia, and believe that increased amounts of urobilin in the feces always indicate blood-destruction. Any attempt, however, to gauge the amount of the latter by the quantity of urobilin must result in failure as it is impossible to estimate the amount of absorbed urobilin, by no means a negligible factor.

Should One Test for Urobilin or Urobilinogen? Urobilin and urobilinogen are closely related substance both arising from bilirubin and biliverdin of the bile by the reducing action of intestinal bacteria. Urobilinogen is an unstable body, as it can be formed from urobilin and can be oxidized to urobilin. In health, there are only traces of urobilinogen in the urine, and no urobilin, but in disease, both are present in considerable amounts. Urine, when it is exposed to light and air, loses its urobilinogen and the amount of urobilin is increased. It is for this reason that Hildebrandt² recommends one to oxidize the unstable urobilinogen to urobilin and test for the latter. The reagent employed in zinc acetate 10 grams, alcohol (absolute) 100 c.c., which is to be shaken before using. One-third or one-half of a test-tube is filled with this solution and an equal amount of urine is added. The whole is thoroughly shaken and allowed to stand twenty-four hours, at the end of which time there will be a fluorescent appearance to the mixture. The test for urobilinogen is only applicable when the urine has been freshly voided, and for practical purposes it suffices to make the test for urobilin.

Attention must be called to the fact that formaldehyde in the urine interferes with the test for urobilin, a fact to be borne in mind when giving hexamethylenamin.³

DISEASES OF THE PANCREAS.

The past year has been productive of but little new and valuable work on pancreatic disease. There have been no "new tests," but the aim has

¹ Zeitsch. f. kl. Med., 1913, lxxviii, p. 387.

² Archiv. f. Verd. kr., 1913, xix, p. 442.

³ Hausmann, Deut. med. Woch., 1913, p. 1685; Schelenz, Med. Klin., 1913, p. 622.

seemed to be rather a closer study of those tests which appear to promise the most in the diagnosis of lesions of the pancreas. It cannot be said that we have advanced materially, however, in the direction of diagnosis, and this field of original investigation must be regarded at present as scarcely touched. Certain tests, such as the Cammidge reaction, for instance, to name but one, have become almost forgotten, and attention is more and more concentrated on the detection of ferment activity, whether in the duodenal juice or in the feces.

Achyilia Pancreatica. This term, which I believe was first used by Schmidt, has been the subject of some criticism, particularly by certain American authors. It was used to describe a clinical condition of chronic pancreatic insufficiency, recognized not alone by absence of certain ferments but also by a poor utilization of meat and fat (creatorrhea and steatorrhea) the latter being seen after Schmidt's test diet.

The question has been raised whether in such cases one has to deal with a pure functional condition of the pancreas or whether the organ is not chronically diseased. As a means of differentiation, Gross states that the symptoms in organic disease are much more severe, that the trypsin is absent from the stool and medication has little effect, whereas in functional disturbances the symptoms are milder, trypsin is lessened, not absent, and suitable medication improves the condition.

V. Kern,¹ in addition to acidol pepsin tablets, recommends injection of pilocarpin 0.01 four to six times a week.²

Duodenal Tube. In comparison with Schmidt's test, Sahli's method, Loewi's test, and the behavior of feces on serum plates, Glatz³ finds the duodenal tests to be far superior. It seems from his work that there is no interference with pancreatic activity in diseases of the gastro-intestinal tract, provided the pancreas itself remains intact; in other words, failure to detect the various ferments is indicative of some functional change in the pancreas.

Landau and Rzasnicki⁴ have industriously compared the oil-test meal for obtaining ferments with the use of the duodenal tube for the same purpose, and prefer the latter. The disadvantage of testing for ferments in the gastric contents, is that only positive results count for anything, as it is no indication of pancreatic disease if no ferments are found, with the duodenal sound, the case is different, as the failure to find ferment activity in the duodenal contents is a good index of pancreatic disease.

Quantitative Estimation of Pancreatic Insufficiency. Matko⁵ gives the patient, one-half hour after a liquid evening meal, 15 grams of Carlsbad salts in 300 c.c. of water, followed in two hours by a high soapsuds enema. If there is no stool by 1 A.M., the enema is repeated. At 7 A.M. the

¹ Deut. med. Woch., 1914, p. 2085.

² See also Schmidt, ibid., 1914, p. 1208.

³ Arch. d. Mal. de l'App. Dig., 1914, viii, p. 121.

⁴ Zeitseh. f. kl. Med., 1914, lxxx, p. 307.

⁵ Arch. f. Verd. kr., 1913, xix, p. 663.

patient receives 130 to 150 grams lean veal cutlet and a 0.3 carmin capsule, followed in two hours by 15 grams of Carlsbad salts in 400 c.c. of water. A liquid stool is obtained usually between four to five hours later, and the total amount is about 300 to 700 c.c., passed in several portions. All stools are preserved on ice until the final one is collected, then measured and filtered. In the filtrate, the trypsin is determined. The object of the violent purgation seems to be to stimulate *ad maximum* the secretory power of the pancreas. Even in health it was found that the amount of trypsin varies considerably (6000 to 100,000 units). In cases of pancreatitis (achylia pancreatica) the units range between 0 to 5000.

Lipschütz¹ makes use of a similar method and believes that when there is no trypsin digestion, the indications are that there is a functional disturbance of the pancreas, while positive results are less conclusive as in the absence of trypsin casein may be still digested by erepsin and also the intestinal bacteria. His trypsin index is much lower than that of Matko, any amount about 100 units speaking for normal pancreatic activity. Examination for lipase promises but little. Lipschütz believes that the testing of fecal filtrate is a much better method of pancreatic testing than is the examination with an oil meal, as suggested by Volhard.

DIASTASE. Marino² has been studying the elimination of diastase in the urine in the course of kidney and pancreas disease and diabetes. In health, the figure ranges from 25 to 100 units, but with nephritis and diabetes, the diastase content is much below these figures. With pancreatic disease, especially necrosis of the pancreas, an excessively large amount of diastase is eliminated in the urine. With pernicious anemia, the proportion is subnormal. In 19 cases of diabetes, the figure ranged from 0 to 12.5 units with a single exception, in which it reached 25; this case was distinguished further by the rapid recovery of the patient. In 32 cases of nephritis, the figure ranged from 6 to 12.5 and 25 in 6 cases, and 50 in 2. In the 11 cases of pernicious anemia, the range was from 6 to 12.5 in all; and in 25 cases of secondary anemia, from 6 to 12.5, with a few reaching 25.

In one case of acute necrosis of the pancreas, the figure reached 200 as also in a case of pancreatic carcinoma. The pancreas affection was diagnosed by the high diastase content. In two cases of chronic pancreatitis, the figure was 100.

Glycosuria as a Sign of Pancreatitis. Spontaneous or alimentary glycosuria has been long held as an important symptom of pancreatitis, but the view is somewhat modified by Waterman³ who found that ligation of the pancreatic duct did not lead to glycosuria even after the disappearance of the pancreatic tissue and of the islands of Langerhans. The

¹ Arch. f. Verd. kr., 1913, xix, p. 562.

² Abstract Journal American Medical Association, 1914, lxiii, p. 72.

³ Ibid., 1913, lxi, p. 377.

original article could not be read, so I am unable to give more than the author's conclusions.

Pancreatic Secretion in Gastric Disease. Since the epoch-making discovery of Bayliss and Starling that the secretion of pancreatic juice is aroused by chemical means (especially hydrochloric acid) and that nervous influences play no role whatsoever, it has always seemed of interest to know what occurred when there was no gastric juice, as for instance, in cases of achylia gastrica. If there is pancreatic secretion, how can it be explained? What is the mechanism of pancreatic secretion in cases of gastrectomy, for we know that man can exist without a stomach? These questions form the basis of a research undertaken by Stepp and Schlagintweit.¹

They obtained human gastric juice from an Ewald meal in cases of hyper-, hypo-, and an acidity. The juice was ground up with a portion of the duodenum of the experimental animal (dog), and after neutralization to a faintly acid reaction a portion was injected into the vein of the animal. Although the results obtained were most variable, they obtained certain facts which are of interest.

In the first place, the gastric contents from cases of achylia failed to act as a stimulator of gastric secretion. In the majority of cases no secretion followed the injection of such. However, in carcinoma cases, with contents containing but very little, or no, free hydrochloric acid, the extractum of juice and duodenum acted very powerfully, more actively than even secretin. The authors proved that it was not the lactic acid which caused the increased amounts of pancreatic juice.

The clinical application of these experiments is not so easy. All one can say is that when there is a deficiency of gastric acidity the pancreatic secretion is not stimulated by chemical agents as in health, but that a different mechanism is called into play, the exact nature of which is not understood.

¹ Deut. Arch. f. klin. Med., 1913, exii, p. 1.

DISEASES OF THE KIDNEYS.

By JOHN ROSE BRADFORD, M.D.

Renal Dropsy. The causation of renal dropsy is still involved in much obscurity and probably much research in the direction of the investigation of experimental nephritis will be needed before the mechanism of this variety of dropsy is thoroughly understood. Many methods are now known for the production of nephritis experimentally, and one that is often used is that of the infection of uranium nitrate.

Boycott¹ has used this method in an experimental inquiry on some of THE CONDITIONS INFLUENCING THE PASSAGE OF FLUID FROM THE BLOODVESSELS TO THE TISSUES or *vice versa*. Uranium nitrate, in doses of 10 mgm. per kilo of body weight, produces necrosis of the epithelium of the convoluted tubules, together with suppression of urine, and the experimental animals usually die on the fourth to the sixth day. Edema is not produced, and the only other lesion usually found is some inflammation of the large intestine. Edema may, however, be produced by giving extra quantities of water, either by the stomach or by injection, and hence it is possible that uranium nitrate may have some special action on the walls of the capillaries, and Boycott's experiments were described more especially for the purpose of investigating this question.

When quantities of sterilized *Ringer's Solution*, equal in volume to the estimated blood volume of the animal experimented on, are injected daily into the peritoneal cavity, even for so long a period as ten days, no definite hydremia is produced in normal animals. In nephritic animals, however, a dilution of the blood is very easily produced by such methods and this hydremia is associated with more or less excess of fluid in the pleural and peritoneal cavities and with some edema of the connective tissue generally.

Boycott conducted a series of experiments in normal and nephritic animals in which, after ligature of the ureters, quantities of *Ringer's solution*, equal in volume to the calculated blood volume of the animal, were injected intravenously and the blood volume was then determined by the estimation of hemoglobin at intervals of five minutes for the period of twenty-five minutes following the injection. In normal animals he found that, on the average, about two-thirds of the injected fluid had left the circulation by the time the injection was completed,

¹ The regulation of blood volume in normal and nephritic animals, *Journal of Pathology and Bacteriology*, July, 1913, vol. xviii, No. 1.

i. e., in five minutes, and that in the successive periods of five minutes 19 per cent., 9.5 per cent., 3 per cent., and 1.7 per cent., respectively, of the fluid injected had been removed from the blood; so that, at the end of twenty-five minutes, the blood volume had again returned to the normal. Even when a second or third injection is given, much the same result was obtained, and thus we see the remarkable fact that an animal can dispose of a volume of salt solution equal in volume to three times the volume of its own blood, even when the ureters are ligatured, so that there is no elimination of fluid by the kidneys. In animals in which nephritis has been induced with uranium nitrate, the greater part of the fluid injected leaves the vessels during the period of injection, but, after this, the excess of fluid finds its way into the tissues more slowly and the blood volume is restored, not only more slowly, but also less completely to the normal.

The results obtained with second and third injections are not very different from those seen with first injections. Boycott also found that differences in the strength of the Ringer solution also affected the result. Thus, in normal animals, solutions containing 0.9 per cent. NaCl leave the blood more rapidly than solutions of the strength of 1.8 per cent., and less rapidly than solutions of the strength of 0.45 per cent. In nephritic animals, solutions of the strength of 0.9 per cent. and 0.45 per cent. NaCl leave the blood less rapidly than in normal animals, but solutions of 1.8 per cent. NaCl, on the other hand, pass out more rapidly in nephritic than in normal animals. The conditions determining the variations in the volume of the blood are the pressure in the blood vessels, the permeability of the capillary vessels, and the molecular concentration of the tissue juice. Boycott considers that his results can be satisfactorily explained on the hypothesis that the nephritis produced experimentally by uranium nitrate decreases the permeability of the vessel wall in both directions.

Boycott¹ has dealt with this question again in a further research, where *proteid solutions* were used instead of saline solutions; otherwise the nature of the experiments was similar to those described above. In most of the experiments a *solution of gelatin* was used, but, in some, horse plasma. The animals experimented on, *i. e.*, rabbits, were not very tolerant to horse serum and two-thirds of the experimental normal animals died during, or soon after, the serum injection had been made; the mortality of the nephritic animals was still higher. The results obtained, however, in the few successful cases, were similar to those obtained with gelatin. When gelatin was used, it was dissolved as a 2 per cent. solution in Ringer's fluid. As the solutions were made with fresh material without previous drying, Boycott is of the opinion that the solution really contained about 1.6 per cent. of gelatin. 48 c.c.

¹ Journal of Pathology and Bacteriology, vol. xviii, No. 4.

of this solution were injected per kilo of the animal's weight and at the rate of 4.8 c.c. per kilo per 30 seconds. In all cases the ureters were ligatured and 10 mgm. of uranium nitrate per kilo had been injected in the cases in which nephritis had been produced, and the actual experiment, *i. e.*, the injection of the gelatin solution and the ligature of the ureters, was carried out on the fourth day after the uranium had been given.

In normal animals, about 75 per cent. of the injected fluid had left the circulation at the end of twenty-five minutes, but even at the end of an hour the blood volume was still some 15 per cent. above the normal; thus the return to the normal is distinctly more slow in the case of the gelatin solution than in the case of Ringer's solution, even in normal animals. With nephritic animals the passage of 1.6 per cent. solution of gelatin out of the vessels is more slow than in normal animals. Some experiments were done with a more concentrated solution of gelatin, *i. e.*, one containing 3.2 per cent. of gelatin, but with this the results were to some extent variable, and in many cases death rapidly followed the injection. Some apparently anomalous results were obtained; thus, in one normal and in two nephritic cases, the blood volume became greater than could be accounted for by the addition of the injected fluid to the circulating blood. In some of these cases, death apparently resulted from the overfilling of the circulation, and asphyxia ensued, although there was little or no pulmonary edema.

Boycott considers that a 75 per cent. increase in the volume of the blood is dangerous and liable to cause arrest of the heart, and that doubling the blood volume is rapidly fatal, whereas a 50 per cent. increase seems to be borne pretty well. In a few instances death occurred from pulmonary edema, as was also the case when strong salt solutions were injected.

Boycott made some *observations to determine whether the injected gelatin itself left the vessels* and passed into the tissues with the water. He used as a method the estimation of the amount of gelatin in the blood-serum, the proteids in the serum were precipitated by heat and the addition of butyric acid. The gelatin in the filtrate was precipitated by tannic acid and the N in the precipitate determined by Kjeldahl's method. By the use of these means Boycott was able to show that all the injected gelatin was not retained in the circulation, and he concludes that, in normal animals, about twice as much of the injected liquid leaves the circulation as of the gelatin, and, further, that the quantity of gelatin that leaves the circulation varies with the quantity of liquid so lost. He has not arrived at any conclusion as to whether nephritic animals behave differently in this respect from normal animals. He is, however, of the opinion that *some of the serum proteins may also pass out into the tissues along with the injectum*, and, in two experiments in which Ringer's solution was used as the injection fluid to test this point,

in one case 18 per cent. of the serum proteids, and, in the other, 6 per cent. was apparently passed out. He finally concludes that after the intravenous injection of gelatin solutions, the blood volume is restored more slowly in nephritic than in normal animals, that a portion of the injected gelatin leaves the vessels, and that this is roughly in proportion to the quantity of water expelled from the blood into the tissues. In some cases, however, water is taken up from the tissues by the blood and thus, after an injection of gelatin solution, the blood volume actually becomes larger than the mere run of the volume of the injected solution and the normal blood volume.

Chisolm¹ has conducted a similar series of experiments to those performed by Boycott with saline solutions. He has used potassium chromate instead of uranium nitrate as the agent for producing nephritis, in order to determine whether the alteration, if any, caused in the capillary wall is really due to the nephritis and not to the action of the toxic agent uranium or chromate used for the induction of the nephritis. Both uranium nitrate and potassium chromate produce very extensive necrosis of the epithelium of the convoluted tubules, but there is some difference in their action, since, when large quantities of salt solution are given by the mouth to the animals suffering from nephritis, edema is produced in the case of the uranium nephritis but this is not the case in the chromate nephritis. It might therefore be argued that the uranium possibly injured the epithelium of the capillaries, or at any rate that it had some action on the mechanism governing the interchange of water between the tissues and the bloodvessels.

Chisolm found, in his experiments with chromate nephritis, that the nephritic animals did not eliminate the injected Ringer solution of normal strength from the bloodvessels as rapidly as the normal animals. Thus the normal animal disposes of 57 per cent. of the injected fluid during the actual period of injection, and in forty-five minutes the blood volume has returned to the normal. In the nephritic animals, only 43 per cent. is eliminated during the period of injection and the blood volume remains stationary after thirty-five minutes. According to Chisolm, about 12 per cent. of the fluid remains in the vessels, and hence the blood volume does not return to the normal. When Ringer's solution of double strength was used, Chisolm obtained somewhat similar results, both in normal and in the nephritic animals, and thus his results differed from those obtained by Boycott. The latter observer found that when Ringer's solution of 1.8 per cent. strength was injected into normal animals, it left the vessels more slowly than when at the strength of 0.9 per cent. but Chisolm found no obvious difference, and he also found that its excretion was delayed in nephritic animals, whereas

¹ Regulation of Blood Volume in Experimental Nephritis. *Journal of Pathology and Bacteriology*, vol. xviii, No. 4.

Boycott found the excretion of this strong saline solution in nephritic animals rather more rapid than in normal animals.

Although there are some differences in the results obtained by these two observers, yet the broad fact remains that in chromate nephritis, as in uranium nephritis, there is some change in the permeability of the capillary wall and Chrisolm considers that, in chromate nephritis, this change is of such a nature as to hinder the passage of fluid from within outward.

Chrisolm¹ has also investigated the *water-content of the tissues in experimental nephritis*. In these experiments, nephritis was produced in rats with uranium nitrate, potassium bichromate, or potassium chromate, and the water-content of the tissues determined after the intraperitoneal injection of large quantities of Ringer's solution of normal strength. Chrisolm found under these circumstances that an excess of water was present in the kidneys, muscles and subcutaneous tissues; the other organs, with the possible exception of the alimentary canal, were unaffected. One rather interesting conclusion of the work is that the presence of subcutaneous edema is not a measure of the amount of water present in the muscles and in the subcutaneous tissues. This is a conclusion of some interest when we remember how apt the clinician is to estimate the total amount of dropsy in a severe case by the amount of subcutaneous edema. It is by no means unusual for large quantities of dropsical fluid to be present when subcutaneous edema is not specially marked, and, conversely, for this to be very obvious without any corresponding amount of general dropsy.

Rozzaboni² has conducted an experimental inquiry on the **EFFECTS OF TORSION ON THE KIDNEY**. In all cases the most strict antiseptic precautions were used and the animal's kidney was exposed sometimes by a lumbar, and sometimes by an abdominal, incision. In all, he performed 68 experiments; in twenty-seven, simple permanent torsion was made and the organ fixed after torsion by two stitches. In seven instances temporary torsion only was made, and, in fourteen, torsion associated with decapsulation in order to determine the effect of this on the circulation in the kidney. In ten cases torsion was made and the kidney then enveloped in the omentum. In four cases torsion of the kidney was followed by the development of hydronephritis. The remaining six experiments were simply controls where decapsulation was performed without torsion. Varying degrees of torsion were employed, in some cases rotation through a quarter of a circle, in others half a circle, in others either one complete rotation or, in some instances, two, or even three, such rotations. Observations were made on the kidney at periods varying in different cases from a few hours to 198 days after the torsion had been produced.

¹ Journal of Pathology and Bacteriology, vol. xviii, No. 3.

² Archives de médecine expérimentale, tome xxvi, March, 1914, No. 2.

The results, as might be expected, depend largely on whether the torsion was incomplete, *i. e.*, a quarter, or half rotation, or whether it was complete, involving one or more complete involutions. When the torsion is incomplete the phenomena of vascular stasis predominate at first, but some degenerative changes in the renal epithelium also occur, although the renal tissue may ultimately return practically to the normal. Nevertheless, even in such cases, small areas of new connective-tissue formation are found here and there in the kidney substance, and some of the renal tubules are lined by apparently newly formed epithelial cells with clear protoplasm, large, deeply staining nuclei, and not showing any striation of the protoplasm so characteristic of normal renal epithelium. When the torsion is complete, the results are strikingly different and the renal lesions are extremely well marked. The epithelial lining is especially affected, degenerates and becomes necrotic, the glomeruli and the interstitial tissue are more resistant, but these also in time undergo necrotic changes and the bloodvessels become thrombosed. The basement membrane of the tubules is, however, very resistant, and even after the lapse of months, and in completely atrophied kidneys, it is still easily visible on microscopic examination. In cases of extreme torsion, the remains of the kidney become fibroid and very frequently also calcified.

The author passed on to describe the effects of temporary torsion, when the kidney has been rotated round the axis of the pedicle once and when the abnormal position of the organ has been maintained for from one to six hours and when the kidney has been untwisted and replaced in its normal position. This experiment was performed on eight animals; in four cases death ensued a few days after the torsion had been produced, and, in these fatal cases, lesions similar to those described above were found. In the remaining four cases, hydro-nephrosis was found in one, and in the other three some connective-tissue overgrowth was present together with atrophy of some tubules and a new formation of epithelium in some of the tubules.

Having thus determined the results produced by simple torsion of varying degrees of severity, the author proceeded to ascertain whether the development of these results would be influenced by such a procedure as decapsulation which is supposed by many to have an influence in reëstablishing, or any rate in affecting, the renal circulation. To test this he carried out fourteen experiments where varying degrees of torsion from one-quarter of a rotation to three complete revolutions of the renal pedicle were combined with decapsulation. The results obtained were as follows: In the cases in which but little torsion had been employed, *i. e.*, a rotation of from one-quarter to one-half of a circle, the only changes from the normal shown by the kidney were some foci of connective-tissue hyperplasia probably associated with the formation of a new capsule, together with some epithelial pro-

liferation of the epithelium of the tubules. On the other hand, in the cases in which the torsion amounted to one, two, or even three revolutions, there were very marked lesions, the secreting epithelium presenting marked necrotic changes except in a narrow lamella just at the periphery of the cortex. The organ as a whole became greatly swollen and engorged, and, in addition to the vascular engorgement, there was considerable hemorrhagic extravasation, both in the interstitial tissue and in the lumen of the tubules.

Thus decapsulation does not modify the results of torsion of the renal pedicle in the direction of making the effects less, and the same is true of the results following the envelopment of the twisted kidney in omentum. This procedure also does not materially modify the results, although the author notes one case in which, one month after the torsion (which consisted of one complete rotation), the kidney was found to be normal in structure in many parts and in other parts only showed some connective-tissue overgrowth and some atrophy of tubules and glomeruli. Hydronephrosis only occurs exceptionally as a result of these experiments and this is probably due to the fact that, in order for it to occur, it is not only necessary that the torsion should obstruct the ureter, but also that the renal epithelium should remain capable of active secretion.

The author concludes by drawing attention to the changes that occur in the opposite kidney. In the first place, some so-called compensatory hypertrophy occurs, and the author is of the opinion that the glomeruli and the tubules are actually increased in size, and that, in addition, there is some hyperplasia of the epithelium both of the cortical and of the medullary tubules. He describes some of the renal tubules as being transformed into compact columns of cells without any lumen. The cells are oval or polyhedral, with clear or finely granular protoplasm and with large, deeply-staining nuclei. He expressly states, however, that he has been unable to detect any formation of new tubules or of glomeruli. In addition to this hypertrophy, other changes in its opposite kidney are described, such as vacuolation of the protoplasm of the cells lining the convoluted tubules and the loops of Henle. The hypertrophy is especially marked, as would be expected, in the cases in which the torsion of the kidney has led to complete atrophy of the organ. The causation of the retrogressive changes, such as the vacuolation of protoplasm, etc., is very obscure, but it is of course possible that it is due to the absorption of the products of necrosis in the damaged kidney, and the nephrotoxic action of these on the opposite organ. It would appear from these experiments that the kidney may recover from the effects of torsion of its pedicle, provided this does not amount to more than from one-quarter to one-half of a revolution, and, finally, that procedures such as decapsulation have but little effect on the ultimate issue.

Dyspnea in Cardiac and Renal Disease. F. W. Peabody¹ has conducted an inquiry into the CAUSATION OF DYSPNEA IN CARDIAC AND RENAL DISEASE, more especially from the point of view of the influence of chemical stimuli on the activity of the respiratory centre and also on the question of whether the excitability of the centre remains constant or whether it is liable to variation. This research is a good example of the increasing complexity of modern clinical inquiries and how the most recent methods of research employed in the physiological laboratory may find a fruitful use when turned to the investigation of clinical problems. The excitatory stimulus of the respiratory centre has long been regarded as a chemical one, and the work of many physiologists seemed to point to the conclusion that this chemical stimulus was the amount of CO_2 in the blood. More recent work has led to the suggestion that the effective stimulus is rather the hydrogen-ion concentration of the blood and that the variations in the amount of CO_2 in the blood are only the result of the elaborate mechanism that strives to keep the hydrogen-ion concentration of the blood constant.

The kidney plays an important part in this mechanism inasmuch as it has the power not only to excrete acid, but also to separate acid from the base combined with it, and to excrete the acid motility. The lungs are also very important parts of this regulating mechanism, as they excrete carbon dioxide, and, as Peacock points out, any tendency to an increase in the amount of acid in the blood and tissues is compensated by an increase in the activity of respiration and to an increased elimination of CO_2 . It would thus seem possible that the kidneys are the most important factor in the regulation of the reaction of the blood. A diminution in the CO_2 tension of the alveolar air, and therefore of the blood, is not regarded by all physiologists as indicative of an excess of acids in the blood, as it is possible that this condition might be brought about by an increased excitability of the respiratory centre. This, however, is a moot point, although it is of much interest from the pathological point of view.

In such an investigation as that of Peacock, it is clear that observations on the blood, urine and alveolar air were necessary; three separate samples of air were always taken and the gas analyses were made with the small Haldane gas-analysis apparatus. The hydrogen-ion concentration was determined by means of the concentration cell, and, for the details of the method used, the original paper must be consulted as the method is a very technical one, but it may be said a Lippman capillary electrometer was used. When saturated with CO_2 at 40 mm. pressure, the hydrogen-ion concentration of normal blood is represented as $\text{Ph} = 7.45$, the extreme variations being 7.40 and 7.50. In all

¹ Studies on Acidosis and Dyspnea in Renal and Cardiac Disease, Archives of Internal Medicine, August, 1914, vol. xiv, No. 2.

instances the hydrogen-ion concentration of the blood—*i. e.*, the Ph—was determined when it had been saturated with a mixture containing CO₂ at 41 mm. tension. This may be considered the tension at which the blood is saturated when the alveolar CO₂ is normal.

As regards the urine determinations, the N was determined by the Kjeldahl process, and the hydrogen-ion concentration was ascertained by a colorimetric method. Cases of renal disease were investigated by these methods and Peacock divides them into two groups: First, those of uncomplicated nephritis and, second, those of nephritis with uremia. A mild degree of acidosis is often found in nephritis, as is indeed shown by the high hydrogen-ion concentration of the urine, but the increased excretion of acid prevents any accumulation in the blood and hence there is no decrease in the tension of the carbon dioxide in the aveolar air. These conditions obtain even when the nephritis is of considerable severity.

The work of other observers has also shown that, in cases of nephritis without uremia, the carbon-dioxide tension was normal. When uremia is present, however, the results may be very different, since in such cases the blood often shows evidence of acidosis and the carbon-dioxide tension in the alveolar air may be much decreased. Peacock's results confirm generally the work of previous observers, and he states that low figures for the CO₂ tension in alveolar air may be found in some mild cases of uremia, but he is of the opinion that the higher grades of acidosis are not found except in severe and usually terminal cases. The development of acidosis in renal disease does not seem to bear any relation to the amount of non-protein N in the blood, and it would seem that it is only when the excretory activity of the kidney has been greatly reduced, that the signs of acidosis in the blood develop. Peacock lays stress on the interesting facts that dyspnea on exertion was observed in some of the cases long prior to the onset of the acidosis, and, on the other hand, that when acidosis was present dyspnea was not always a prominent feature and, finally, that in no case was an acidosis comparable in amount to that seen in diabetic coma, found.

Peacock is of the opinion that in combined cardiorenal disease the dyspnea is essentially a phenomenon of circulatory failure, and that the renal lesion plays only an accessory part. In the course of his researches, he also made similar analyses of the blood, urine and alveolar air in cases of cardiac dyspnea where no renal disease was present. He found, in cases of cardiac disease with dyspnea, that there is sometimes a slight accumulation of non-volatile acids in the blood, but by no means always. The tension of the carbon dioxide in the alveolar air is normal or slightly increased, but, even when acidosis is present, he is of the opinion that it is not sufficient in amount to be the cause of the dyspnea. Thus, he comes finally to the conclusion that, both in the renal cases and in the cardiac cases, there must be some alteration in the excita-

bility of the respiratory centre and that the development of acidosis is not the direct and sole cause of the dyspnea.

Pyelography. Kretschmer and Potter¹ describe three cases of renal disease where pyelography was of service in arriving at a diagnosis and they discuss shortly the methods and uses of this procedure. In the same journal, Caulk² gives a very full review of the recent literature dealing with PYELOGRAPHY IN THE DIAGNOSIS OF RENAL DISEASES. Although the method was only introduced as recently as 1906, yet it has been used to a considerable extent, although there is, as might be expected, some difference of opinion as to the best means to employ in order to obtain the best results. According to Caulk, all writers are agreed that a general anesthetic should not be given and in fact that all sedatives should be avoided, so that the patient may be conscious of any discomfort or pain in the renal region. In this way some of the more serious accidents arising from undue distention of the renal pelvis may be avoided.

Three methods have been employed for filling the renal pelvis: In two of them the renal pelvis is distended with some shadow-producing solution, and, in this way, not only can an *x*-ray photograph be obtained, mapping out the renal pelvis, but its capacity can also be gauged with considerable accuracy. In the third method, oxygen gas is injected into the ureter under pressure from a container. If fluid is injected into the renal pelvis, this may be done either by gravity or with a syringe. In the earlier work a syringe was used, but this has now been given up by most workers, as it is difficult to regulate the pressure, and some of the accidents that have occurred in the course of using this method have been attributable to the forcible injection with the syringe. A far better method is that in which the fluid is allowed to flow from a graduated burette placed almost two feet higher than the patient. In this way many of the complications ascribed to pyelography, but really due to the use of the syringe, have been avoided.

Many solutions have been used: Collargol, from 3 to 50 per cent.; cargentos, 25 to 50 per cent.; silver iodide, 10 per cent.; argyrol, 10 to 25 per cent.; silver nitrate, 1 per cent., and others. According to Caulk, collargol has been most used and with more success than the others, but Kretschmer and Potter definitely state that they have obtained the best results with a 25 per cent. solution of cargentos. Some authorities have looked upon collargol as irritating, but it would seem more probable that the pain sometimes following pyelography is due rather to mere distention of the renal pelvis and not to any irritation set up by the drug. There is also some disagreement as to the necessity or desirability of causing pain. Many think that the photograph should not be taken until pain is produced, as this is an indication

¹ Interstate Medical Journal, February, 1914.

² Ibid.

that the renal pelvis is really full. Others consider that pain should not be caused, and are in the habit of employing various mechanical devices to prevent distention of the renal pelvis. It is not possible as yet to dogmatize on this point. Some authors advise lavage of the pelvis with boric acid to remove the excess of collargol, whilst others think that the residual collargol left in the renal pelvis is valuable from its antiseptic action. The capacity of the renal pelvis is variously estimated and is said by some to vary from 5 to 15 c.c. It is probable that pyelography is of most use in the diagnosis of early hydronephrosis and also in displacements of the kidney, congenital or acquired.

As regards complications, Caulk quotes Braesch as recording 1000 cases without any serious accidents, but in other series such serious complications as pain, fever, suppression of urine, argyria have been noted, and, in exceptional instances, death has followed within a short interval.

Pain is usually of a dull, aching character, and generally subsides quickly; renal colic has only been noted by a few observers and then it has followed forcible injection with a syringe. Fever is also usually slight and does not last more than forty-eight hours. If the pyremia is more severe, or of more prolonged duration, it is probably due to infection from faulty technique. Some serious and fatal complications have been noted by other observers; thus, rupture of the kidney and perinephritic abscess have both been recorded where a syringe has been used. In one instance, death from argyria occurred eight hours after the injection, but it is probable that in this case absorption occurred from an inflamed pelvis. In some cases infiltration of the renal tubules with collargol occurs and it may even be seen in the *x-ray* photographs infiltrating the renal cortex. In these cases the urine shows the presence of a mild nephritis, but this usually clears up. Kretschmer and Potter point out that care should be taken in selecting the cases, and that the method should not be cited in any case where the patient's general condition is such as to contra-indicate cystoscopy.

Stricture of the Ureter. Baar¹ discusses THE ETIOLOGY, DIAGNOSIS, AND TREATMENT OF STRICTURE OF THE URETER in an article on *stricture of the ureter simulating nephrolithiasis*. The patient, a man, aged forty, had frequent attacks of pain in the right renal region radiating like attacks of renal colic, and the urine contained a few calcium oxalate crystals together with some pus corpuscles and a few red-blood corpuscles. On cystoscopic examination it was found that the urine of the right kidney contained pus cells and gonococci, that of the left kidney no pus and no gonococci. The right renal pelvis was catheterized and injections of silver nitrate and of protargol injected into it.

After this treatment, the attacks of renal colic ceased and the author

¹ Interstate Medical Journal, January, 1914.

was of the opinion that an inflammatory stricture of the right ureter was responsible for producing the attacks of renal colic.

Baar believes that ureteral strictures should be divided into the *congenital* and the *acquired*. Among the *congenital*, cicatricial constrictions of the ureter are found; these are possibly the result of lesions due to the formation of uric acid concretions in fetal life. Valvular strictures produced by duplications of the mucous membrane are also found. Congenital strictures may also take the form of kinks of the ureter, and these may be of importance in the etiology of subsequent hydronephrosis. Congenital strictures are found mostly at the upper or lower ends of the ureter, and Baar quotes Tuffier as stating that in 29 cases of congenital hydronephrosis a stricture was found at the upper end in 15 cases, and at the lower end in 14. *Acquired stricture* of the ureter may be either of traumatic or of infective origin. Among the traumatic causes may be included injuries, such as a kick in the abdomen by a horse, postoperative traumas and injuries caused by renal calculi. Calculi are liable to be arrested in the ureter and to produce traumatic strictures, especially in three situations: (1) The insertion of the ureter in the renal pelvis, (2) the lower third of the ureter, and (3) the intravesical portion of the ureter. Inflammatory strictures of the ureter are generally multiple and in this manner are in marked contrast to those of congenital origin. In cases of ascending infection where ureteritis is present, affecting principally the inner layers of the ureter, the stricture is more especially liable to form about 3 cm. above the opening of the ureter into the bladder and also at the point of union of the ureter with the renal pelvis.

Periureteritis is also liable to cause occlusion of the ureter, but, in such cases, the thickening is apt to be general and to involve the greater part or even the whole length of the ureter. According to Kelly, quoted by Baar, tubercle is the commonest and gonorrhea the rarest cause of ureteritis in women, but other observers are of the opinion that gonorrhea may be a cause of ureteral stricture. The diagnosis of stricture of the ureter is difficult unless the ureter is catheterized and then the diagnosis can be made by noting the point at which the flow of urine ceases on withdrawing the catheter and also sometimes by noticing the "grip" of the stricture on the catheter.

As regards symptoms, pain, increased frequency and urgency of micturition are usually present; the pain is said to be located between the point of obstruction and the tenth rib.

The treatment of ureteral strictures is obviously surgical; sometimes they may be treated by dilatation or by dilatation combined with washing out of the urinary tract above the stricture with silver nitrate or bichloride of mercury. In other cases, partial resection of the ureter or implantation of the remainder of the ureter into the bladder may be done. In some cases complete extirpation of the urinary tract

above the stricture, together with the kidney, is necessary; this is more especially so in cases of tuberculous stricture.

Nephritis. Kinloch¹ has conducted a series of investigations into the EXCRETION OF URINARY SOLIDS IN NEPHRITIS, confining himself especially to the nephritis of scarlet fever and of diphtheria. The types of nephritis specially investigated by him were the acute glomerular and the acute interstitial nephritis and he regards both forms as occurring regularly in scarlet fever and diphtheria. Acute glomerular nephritis has been looked upon as peculiarly associated with scarlet fever, but modern work has shown that extensive hyaline degenerative lesions of the glomeruli are of common occurrence in diphtheria and that even in scarlet fever such lesions may be present and yet not be obvious unless special methods of staining are employed.

The two varieties of nephritis, glomerular and interstitial, may be differentiated clinically, both in scarlet fever and in diphtheria. The glomerular nephritis of scarlet fever, according to Kinlock, appears late in the course of the disease and causes profound disturbance of the general metabolism of the body. As regards the urine, it is characterized by a diminution in the amount of the daily output and by the presence of blood, albumin, and tube casts. The interstitial nephritis, on the other hand, is only part of the general disturbance, and, although it persists after the subsidence of the acute febrile symptoms, the urine is not diminished in quantity, and, although it contains albumin, no blood is present. It is less easy to differentiate the two varieties of nephritis in cases of diphtheria, as either may occur within the first fortnight of illness and may produce only mild general changes; suppression of urine, however, to some degree is the most characteristic feature of glomerular nephritis.

In addition to these two varieties of nephritis, a toxic nephritis, merely part of the general toxemic process may be present and is similar in character to the less severe forms of nephritis seen in a number of febrile diseases.

Kinloch describes the glomerular nephritis of scarlet fever as most liable to occur about the end of the third week of illness at a time when the patient is convalescent; it is apt to be ushered in with fever, pain in the back, vomiting, and often a variable degree of subcutaneous edema is present, the excretion of urine may be suppressed, and the urine is always much diminished in quantity and contains blood and albumin. The nephritis is not correlated with the severity of the scarlet-fever infection and this complication is as prevalent in adults as it is in children, although scarlet fever is usually much milder in adults than in children.

Interstitial nephritis, on the other hand, occurs most commonly in

¹ Journal of Pathology and Bacteriology, July, 1914, vol. xix, No. 1.

severe cases of scarlet fever and more especially in cases associated with septic infection. Kinloch states that the onset of the nephritis is indefinite and that it is apt to occur toward the end of the second week, when the presence of profound prostration and marked secondary anemia may suggest the development of this complication. The urine is not diminished in amount, and albumin is generally present in small amount, but may be absent. In diphtheria, glomerular nephritis may occur, and, if so, usually develops within the first fortnight of the illness. This complication is far less serious than the glomerular nephritis of scarlet fever, but there may be a rise of temperature, slight general edema, blood and albumin in the urine, together with a diminished secretion of urine. The blood usually disappears from the urine rapidly, *e. g.*, in ten days and the albuminuria rarely persists.

Kinloch recognizes three varieties of interstitial nephritis in diphtheria: (1) the common variety in which no suppression of urine occurs, (2) a form associated with the presence of serum rashes and where there is some suppression of urine, and (3) a form associated with late septic infection. The first variety occurs more especially in the most severe forms of diphtheria; objective symptoms are usually absent, but there may be slight anasarca of the face and hands, the urine contains a considerable quantity of albumin, casts are scanty and only of the hyaline or granular varieties; there is no diminution in the amount of urine, and blood is absent. This complication is not a serious one, it occurs early in the course of the diphtheria and the albuminuria rapidly clears up in from two to three weeks. In the second variety, associated with the serum disease, the onset is very definite and occurs either simultaneously with, or slightly after, the onset of the rash and joint pains. Kinloch describes a general lymphangiectasis not pitting on pressure and involving the muscles as well as the subcutaneous tissues. The area of precordial dulness becomes increased and the heart sounds become soft and the rhythm of the heart irregular, the urine contains a moderate amount of albumin with casts of the granular and epithelial varieties. Pyrexia is generally present and runs an irregular course for about a week and then the anasarca subsides with an increased flow of urine. The third variety of nephritis is associated with septic cases of diphtheria, the patient is usually acutely ill and albumin is present in considerable amount, the urine markedly diminished in quantity with granular casts but without the presence of blood.

Although a typical diminution in the quantity of urine occurs in the glomerular nephritis, both of scarlet fever and of diphtheria, yet this diminution is much more persistent in the nephritis of scarlet fever than it is in the glomerular nephritis of diphtheria. Similarly, the nitrogen output is small, both as shown by percentage and by total output in the glomerular nephritis of scarlet fever, whereas in the milder disease complicating diphtheria there is usually free N elimination.

N is freely eliminated in the interstitial nephritis both of scarlet fever and of diphtheria, but in the interstitial nephritis of serum disease, although there is no percentage of diminution in the N excreted, yet the diminution in the quantity of urine limits the daily output of nitrogen.

As regards the excretion of chlorides, in the glomerular nephritis of scarlet fever there is a marked diminution of chloride excretion and this diminished excretion is rather persistent, but in the glomerular nephritis of diphtheria the primary scanty excretion of chlorides is rapidly increased when the flow of urine is increased. In the interstitial nephritis of scarlet fever and diphtheria there is at first a free excretion of chlorides, but this may be diminished later, and this diminution is more evident in the interstitial nephritis of diphtheria and is especially marked in the nephritis of serum disease and in the septic cases of diphtheria.

As regards phosphates, the author concludes that the daily output of phosphorus is usually low and there is no evidence of any increased breaking down of nuclein at any stage of nephritis. Finally, the author found no general ratio between the output of nitrogen and that of sulphur and he considers that the glomerulus excretes sulphates independently of the excretion of nitrogen. One rather remarkable conclusion arrived at by Kinloch is that the excretion of nitrogen appears to be unaffected by the degenerative changes found in the tubular epithelium. He describes the secondary changes in this epithelium as most marked in interstitial nephritis and it is in this variety of the disease that the nitrogen elimination is most free.

GENITO-URINARY DISEASES.

BY CHARLES W. BONNEY, M.D.

THE KIDNEYS AND URETERS.

Floating Kidney. The enthusiasm which was formerly manifested for fixing every movable kidney that could be discovered was gradually succeeded by a reluctance to practice the operation of nephropexy unless the symptoms of which the patient complained could be entirely attributed to the displaced organ. In fact many surgeons ceased to operate except upon the rarest occasions. At the present time it would seem that the conservative English practice the operation more generally than do surgeons of other nations. In a very instructive article on this subject, Marion¹ endeavors to show that the disrepute into which nephropexy has fallen is not altogether merited, and that if the cases be carefully selected excellent results will be obtained. He also emphasizes the importance of proper technique. Both these desiderata are in accord with the best surgical judgment of the day.

In the operation which Marion practises the kidney is exposed by the usual lumbar incision, after which the capsule is split by an incision beginning at the upper pole and extending down to the lower third of the organ, thus leaving the lower pole encapsulated, and suspended by its proper covering. One of the most important steps of the operation, according to the author's opinion, is to leave the lower pole of the kidney covered by capsule. He points out that if the entire convex border be decapsulated, the decortication will extend to the inner border of the organ when traction is made upon the flaps, and thus give rise to compression of the ureter and vessels, an occurrence likely to destroy the functional result of the operation. After decortication of the anterior and posterior surfaces and the superior pole has been effected, the flaps thus obtained are split in two, forming an anterior and posterior flap above and below respectively. Through each one of these latter flaps a large catgut ligature is passed, tied once, and then brought around the remaining half and again tied. The strands of catgut holding the supero-posterior flap are then passed through the thoracic wall above the 12th rib, and those holding the supero-anterior are passed above the 11th rib. By reason of the obliquity of the intercostal spaces, the four strands thus passed come through on the same

¹ Journal d'Urologie, June 15, 1914.

horizontal plane, and so draw the kidney up that its inferior third is in contact with the lower extremity of the 12th rib. The strands are

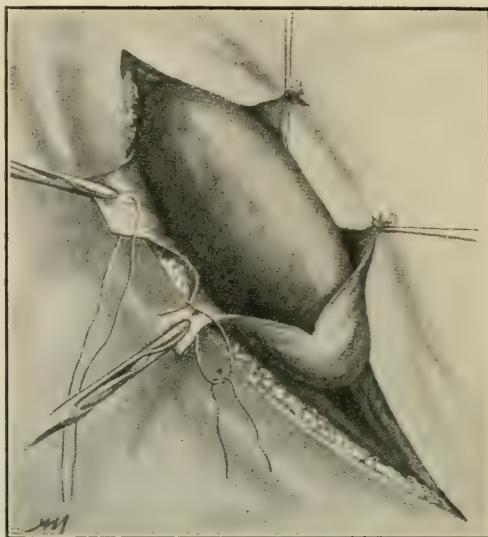


FIG. 27.—Formation of the flaps.

passed directly through the pleura, and the author states that not the slightest inconvenience has ever followed their passage through it.

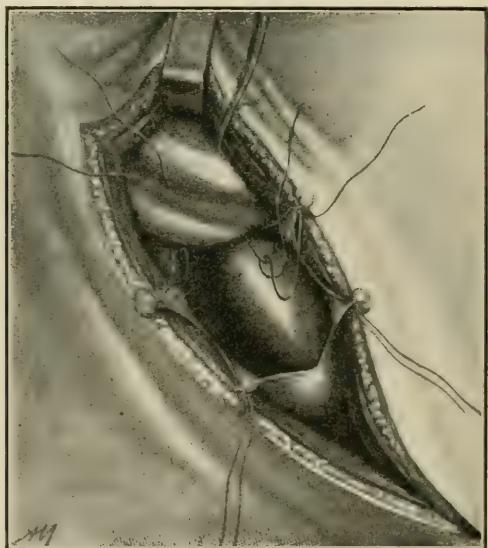


FIG. 28.—Passage of the sutures through the superior flaps.

Formerly, when the Reverdin needle was used, it was found necessary to resect the 12th rib, but since the Albarran needle has been employed

it has been possible to omit the latter step of the operation. High fixation of the kidney, which the author considers to be one of the most



FIG. 29.—The sutures through the superior flaps have been tied. The lower pole of the kidney is no longer seen. One of the sutures through the antero-inferior flap has been passed above the 12th rib.

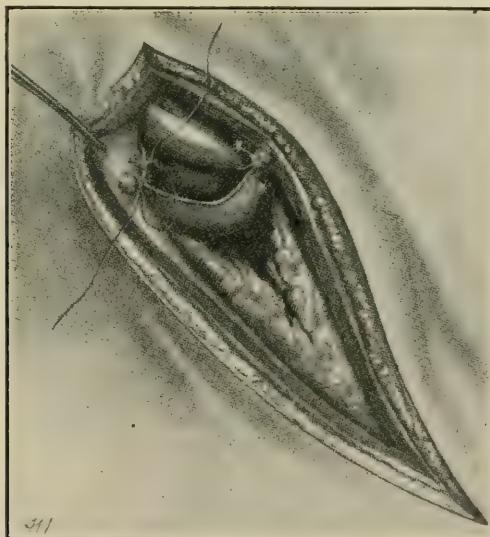


FIG. 30.—Passage of the sutures in the postero-inferior flap through the deep tissues in the posterior margin of the incision.

essential steps in nephropexy, is perfectly accomplished by this procedure. The strands holding the postero-inferior flap are passed through the

lumbar wall at the level of the quadratus muscle close to the costolumbar angle. Care should be taken to pass the sutures well within the substance of the muscle and not too near the edge, as their passage through the edge brings the lower pole of the kidney so far forward that it is impossible to secure adequate muscular covering for it. Those holding the antero-inferior flap are fixed to the end of the 12th rib. The strands are then successively tied while the assistant pushes the superior part of the kidney wall within the wound. Fixation of the organ is accomplished by passing a suture through the fatty capsule and the muscles. The operation is completed by placing a drain below the inferior pole of the kidney and closing the rest of the wound.

The author now always removes the appendix through an incision in the posterior parietal peritoneum.

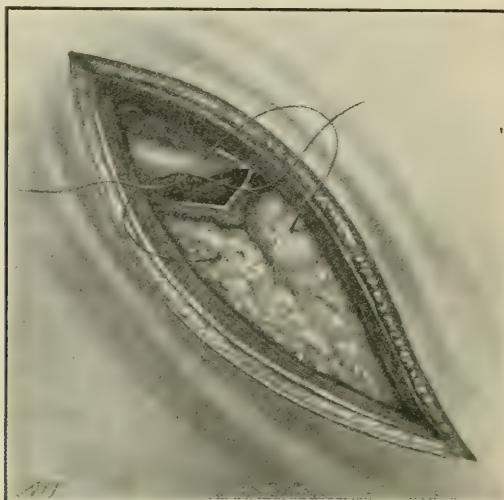


FIG. 31.—Fixation of the adipose capsule below the inferior pole of the kidney.

In 25 out of 26 cases, excellent results were obtained. The relief of the pain and improvement in the general health were the most constant benefits derived from the operation. Digestive and nervous disturbances were not relieved to the same extent as the previously mentioned symptoms. In the unfavorable case there was ptosis of all the abdominal organs. A secondary appendectomy was performed without any appreciable benefit.

Attention is called to the importance of the relief of pain when the patient assumes the recumbent posture, and the author states that he would not advise operation in patients who do not experience such relief. Proper consideration is also given to the after-treatment. He keeps his patients in bed at least three weeks and then, when feasible, continues with Weir Mitchell's rest cure.

G. P. Mills¹ also emphasizes the importance of the relief of lumbar pain by the horizontal position. He advises against operation for gastric symptoms on the plea that movable right kidney may produce kinking of the duodenum. Of 57 patients whose cases he was able to follow, 33 per cent. were cured. He concludes that the general results of nephropexy are bad. Persistent lumbar pain and intermittent hydro-nephrosis constitute the chief indications for the operation, according to his observation and experience.

Schurmann,² of Copenhagen, has also contributed an important article based upon 189 cases of floating kidney operated upon between the years 1897 and 1911 according to Rovsing's method. The technique, as is well known, consists in decapsulating the kidney by a longitudinal incision, the flaps being about 2 cm. wide; these are incised at their extremity on both sides by a T-shaped cut which forms ligaments which are transfixated with a strong silk thread which in turn is passed through the musculature. Of these 189 cases, all but 5 occurred in women. It is possible to follow the history of 171 patients. Out of 107 uncomplicated cases, complete cure resulted in 85 per cent., benefit in 9.3 per cent., and no improvement in 3.7 per cent. Of 64 cases complicated by such conditions as renal infection, cholecystitis, and stomach disorders, complete cure was obtained in 32, improvement in 16, and no result in 14. There were 2 deaths. Relapses occurred in only 3 cases, and these were considered to be due to faulty technique in early operations.

Sarcoma of the Kidney in Infancy. Sarcoma of the kidney in infancy is one of the most fatal diseases to which childhood is subject. Albarran states that only 1 out of every 100 patients operated upon may be expected to recover. An exhaustive study has recently been made by F. McG. Loughnane,³ who states that the object of his paper is to show that operation may occasionally prove successful in cases apparently hopeless. In the records of the London hospitals, he found that one patient had been well for fourteen years and two for ten years after sarcoma was removed. According to Wagner, quoted by the author, permanent cures of from two to eighteen years have been recorded in 34 cases, and 21 of these patients have gone for more than three years. The author states that the immediate mortality of nephrectomy for this condition fell from 76 per cent. in 1885 to 22 per cent. in 1902, and that in a series of 12 cases it was only 7.7 per cent. As gloomy as is the prognosis, it seems good judgment to operate on every child for, if nothing be done, a fatal termination is the only thing to be expected. If 1 out of 100 can be saved, this is something to be thankful for.

¹ Birmingham Medical Review, May 15, 1914.

² Archiv f. klinische Chirurgie, March 24, 1914.

³ British Journal of Surgery, July, 1914.

Rupture of the Kidney. In this review for 1912, reference was made to the excellent results which Michelson obtained in a series of cases of rupture of the kidney by employing conservative treatment in the greater number and resorting to operation only in those which presented special indications for surgical intervention. A more recent contribution made by Ponomareff, of St. Petersburg, based upon 57 cases which occurred in the male wards of the Municipal Hospital Obouchoff, in St. Petersburg, from 1898 until 1912, confirms in every respect the opinions which Michelson expressed. Of these patients, three left the hospital uncured, and their ultimate condition is unknown. Three died as the result of injury to their abdominal viscera sustained at the same time that the kidney was ruptured. The remaining 51 made complete recoveries. Only eight were operated upon. The author considers that hemorrhage constitutes the most frequent indication for surgical intervention. It may cease spontaneously despite its severity, even though it has continued for a long time. Most serious are those cases in which the bleeding is intermittent. As a general rule it may be stated that operation is indicated when the loss of blood begins to affect the patient's general condition. Another indication for surgery is the occurrence of infection in the injured area. In one case this condition made nephrectomy necessary. The author called attention to the fact that elevation of temperature does not always mean infection, for when present without other signs it is often due to absorption of a blood-clot. The third indication for intervention is the formation of a tumor, be it a true hydronephrosis or merely a collection of serum in the pelvis of the kidney.

Diagnosis of such a lesion is difficult, and the author¹ mentions one case in which operation was done for a false hydronephrosis which had been mistaken for an intra-abdominal collection of blood. Except in those cases in which infection has occurred, the operation should always be as conservative as possible because of the tendency of renal tissue to heal and resume its normal function. If the bloodvessels have not been torn away from the kidney suture and tamponing will suffice. If, however, infection has occurred, nephrectomy will often be found necessary. Naturally, in such cases, as in all others demanding operation upon the kidney, the presence of another kidney must be determined before operating, and its functional capacity learned if possible.

Dangers of Pyelography. In the review of two years ago, mention was made of untoward results following the injection of collargol into the pelvis of the kidney. Since that time cases in which serious sequelæ, and even death, followed the procedure have accumulated in considerable number.

In a recent contribution to the subject, J. M. Mason,² of Birmingham, Alabama, reviews the literature and cites several instances in which the

¹ Roussky Vratch, August 31, 1913.

² Journal American Medical Association, March 14, 1914.

injected material passed into the substance of the kidney itself, and even permeated the perirenal tissues. He had two cases in which infarcted areas were found to contain masses of collargol.

Similar cases have been reported by Tennant,¹ Kelly,² Vert,³ Lower,⁴ and Rehn.⁵ At the meeting of the American Urological Association in 1913, E. C. Smith,⁶ of Cincinnati, reported a case of sudden death following the injection of a 20 c.c. of 10 per cent. collargol solution into the pelvis of the kidney, and in the discussion which followed P. McCown,⁷ of Indianapolis, mentioned another which occurred in that city.

Braasch,⁸ who has done much to popularize this method in America and who recently reported 1000 cases in which it was used, has evidently become more conservative regarding its employment, if his later writings can be taken as a criterion. In discussing the subject at the meeting of the American Medical Association last year, he stated that pyelography should not be resorted to in any case in which the diagnosis can be made without it; moreover, under all circumstances, the cases should be carefully selected. He considers it contra-indicated in highly nervous patients, and in those affected with large hydronephroses. In the latter class the collargol solution cannot escape, and the contraction of the pelvis of the kidney, he believes, may force the solution into the substance of the kidney. His statement that it is unnecessary, for the reason that in these cases an accurate diagnosis can be made with the ureteral catheter, is significant.

Precautions taken in the employment of the method embrace careful pulverization of the collargol before the solution is prepared, the use of a solution not stronger than 10 per cent., and its injection into the renal pelvis solely by gravity. It seems to be the consensus of opinion among all those who have had much experience with the method that a forcible injection should never be made.

Vert⁹ suggests that search should be made for another substance that will give a good shadow but not injure the renal tissues, and considers it possible that an emulsion of silver iodide, with which he has already experimented, will fulfil the requirements.

A very interesting communication on the effects of injecting collargol into the renal pelvis has recently been made by Eisendrath,¹⁰ of Chicago, who conducted some experiments upon dogs. He demonstrated that the normal capacity of the dog's renal pelvis is 2.5 c.c. and that as long as

¹ Annals of Surgery, 1913.

² Surgery, Gynecology, and Obstetrics, 1913.

³ Bulletin Johns Hopkins Hospital, March, 1914.

⁴ Transactions American Urological Association, 1913.

⁵ Zentralbl. f. Chir., 1914, No. 4.

⁶ Transactions American Urological Association, 1913.

⁸ Journal American Medical Association, January 31, 1914.

⁹ Bulletin Johns Hopkins Hospital, March, 1914.

¹⁰ Journal American Medical Association, May 2, 1914.

⁷ Ibid.

only moderate pressure is employed so that the normal capacity is not much exceeded, no ill effects follow. In one experiment, in which a quantity eight times that of the normal capacity of the renal pelvis was injected under twice the pressure that it had been found safe to employ, the animal died within five minutes. Upon section large quantities of collargol were found in the inferior vena cava and the right auricle and ventricle. A small amount was detected in the left side of the heart, while the lobes of both lungs were colored black and found to contain the pigment. Upon microscopic section, the liver likewise showed particles of collargol. Similar conditions were noted in another animal which died after the same treatment.

That these experiments caused death by producing an extensive and widely distributed collargol embolism seems to be beyond doubt, and the author expresses the opinion that the sudden deaths which have followed the injection of collargol solutions into the renal pelvis of man have resulted from exactly the same condition. Hence it would seem that the method is not one to be resorted to lightly and by the inexperienced.

Rehn¹ has also performed some experiments upon guinea-pigs, being led to study the effect of injecting collargol solution into the pelvis of the kidney by the effect produced upon the kidney of a woman which he removed at operation after a preliminary injection of her pelvis had been made. He produced hydronephrosis and pyelonephritis in a number of animals before resorting to the collargol injections. In those having pyelonephritis he found exactly the same lesions which he had found in the kidney of his patient; namely, infarcts of the kidney and a collection of collargol around the tubules. Furthermore, he found that some of the collargol had passed into the general circulation, being present in the lungs and the liver. In those animals having hydronephrosis, however, no such phenomena were present, there being simply small quantities of collargol in the dilated tubules. Comparing these experiments with another series made upon animals with normal kidneys, it was found that no collargol escaped from the renal pelvis when the latter was injected to a little less than its normal capacity. The author cautions surgeons against an indiscriminate use of this method, particularly when the pelvis of the kidney is infected or when the renal parenchyma itself is diseased.

Joseph² attaches great importance to exact technique in pyelography, and calls attention to the fact that those who have had the greatest experience with it have had fewer accidents than others. He believes that the use of a very fine ureteral catheter, certainly not larger than No. 6, is important in the prevention of extension of the injected fluid to the parenchyma of the kidney. When such an instrument is used, he finds that any excess flows backward. When the catheter is in place and the urine begins to escape, he removes the cystoscope and

¹ Zentralblatt f. Chirurgie, 1914, No. 4.

² Ibid., July 4, 1914.

fastens the end of the catheter to the thigh with a piece of adhesive plaster. Abdominal breathing is stopped by drawing a girdle tightly around the patient's body. The injection of collargol solution, which he insists must be freshly prepared, is immediately begun, and as soon as the patient feels the slightest sensation of fulness, not to say pain, under the costal margin, the injection is stopped. If he is not sure that the patient can intelligently appreciate a feeling of distention, he never injects more than 3 or 4 c.c. Usually, however, he has been able to inject twice that quantity and sometimes as much as 20 c.c. Instantaneous exposure to the *x*-rays is made the moment the injection is stopped and the catheter removed, and the patient is then made to stand up so that an immediate drainage of the renal pelvis into the bladder begins. He states that since he has followed this technique the solution has not remained in the renal pelvis more than a minute, and also that the patient has been able to return home at once. Unless the ureteral catheter passes easily into the pelvis of the kidney, he does not resort to pyelography; and even when it can be passed without encountering obstruction he does not inject the pelvis if pain or bleeding is caused by the passage of an instrument.

Mr. Thompson-Walker,¹ of London, also contributes a characteristically critical review of pyelography, a study of which corroborates the opinion that he expresses in his recently published text-book on *Genito-urinary Diseases* to the effect that the method should not be resorted to except when the diagnosis can not be made by any other method. In discussing the failures and dangers of pyelography, he states that it would be surprising if the method had proved satisfactory in the hands of all those who have employed it, for the reason that a high degree of manipulative skill is required, not only of the surgeon, but also of the radiographer. In his own experience, one of the most frequent causes of failure has been the escape of the injected solution alongside the catheter, so that the pelvis of the kidney was emptied before the *x*-ray picture was taken. This only confirms the importance of making the *x*-ray exposure as soon as the injection is completed, as Joseph advises. In concluding his article, Mr. Walker states that if the surgeon is unable to guarantee a high degree of skill in the use of the cystoscope and ureteral catheter, he had better let the method alone. This is sound advice which, if supplemented by the admonition to resort to pyelography only in selected cases, will do much to prevent serious results.

The trend of an excellent paper by Keene and Pancoast² is corroborative of the opinions expressed by the last two authors above quoted.

Functional Diagnosis. Since this subject was reviewed in PROGRESSIVE MEDICINE in 1911, the *phenolsulphonephthalein test* has become firmly established as a method of undoubted value for determining the

¹ British Journal of Surgery, July, 1914.

² Journal American Medical Association, August 15, 1914.

functional capacity of the kidneys, and at the present time many urologists believe it to be the most trustworthy single method for ascertaining total renal function. The numerous reports which have been published during the last three years are for the most part confirmatory of the claims made for the test by Rowntree and Geraghty, who first employed it, and to whose work reference was made in this review in December, 1911.

As accurate results depend upon the determination of the exact amount of the drug excreted, it is evident that if the test is to be used for finding the functional power of each kidney, leakage from the ureters must be prevented; consequently ureteral catheters of large caliber must be used. In this test, as in all others in which ureteral catheterization is employed, the possibility of inhibition of renal function must be taken into consideration and, if there is reason to suspect it, total function without ureteral catheterization must be determined, if it has not already been done. Reflex polyuria, which sometimes is produced by introducing catheters into the ureters, has no influence upon the value of a test, as the result depends upon the absolute quantity of the drug excreted. One of the most important recent contributions to the subject has been made by Max Roth,¹ of Berlin. In discussing the adverse reports made by certain authors, notably Vogel, Albrecht, Eichmann, and Rubner, whose papers have been published within the last two years, Roth states that he believes their failure to obtain the results which the test has given in the hands of the originators and others, including himself, is due to faulty technique and to the circumstance that it was applied in some instances to pregnant women, shortly before full term, whose normal renal function was interfered with by their condition. He states that those who have obtained unsatisfactory results in subjects whose kidneys were presumably normal have injected the drug into the gluteal, instead of the lumbar muscles; furthermore, that some of them used a foreign preparation of the drug, which he proved to be much inferior to the American product. In fifty trials made upon forty healthy men, and in twenty-three made upon thirteen healthy dogs, the results were invariably the same as those obtained by Rowntree and Geraghty. In the majority of the cases, 50 per cent. or more of the drug was excreted during the first hour, and 30 per cent. or more during the second hour. This work was done in Casper's Clinic and in the Biological Department of the University of Berlin, and the reputation of the author as a careful, scientific worker is sufficient to assure the correctness of his technique and the reliability of his findings.

The question arises whether every kidney which eliminates a minimum of 40 per cent. during the first hour and a minimum of 60 per cent. during the first and second hours can be considered healthy, or, at least, functionally competent. In answer to this question, Roth states

¹ Zeitschr. f. Urol. drittes Beiheft, 1914.

that in 9 cases of chronic nephritis he obtained a high percentage of elimination. Seven of the patients were in good condition despite their kidney disease, and the author is of the opinion that their reaction to the test is quite in accord with the clinical fact that many persons having chronic nephritis feel well and attend to their business for years. The inference is that their kidneys, though damaged, do the work required by the organism.

Thinking it possible that vascular renal lesions might not materially affect the elimination of the phthalein, which takes place principally through the renal cells, as shown by Rountree and Geraghty, the author produced glomerular nephritis in dogs by giving them canthardin, and then tested their excretion of phthalein. After large doses, which caused death within twelve hours, excretion of the drug was markedly diminished. Microscopic examination of the kidneys, however, showed not only changes in the glomeruli but also cloudy swelling and even fatty degeneration of the renal cells themselves. After smaller doses, following which the animals lived a few days, moderate diminution in elimination was found to occur twelve or fifteen hours after administration of the poison, and slight diminution was noted in some cases at the expiration of thirty-six or forty hours, although at the latter time some of the dogs had as high elimination as perfectly healthy ones, and that notwithstanding the fact that they were very sick. The kidneys of such animals showed pronounced glomerular and interstitial changes. From these experiments Roth concluded that the elimination of phenolsulphone-phthalein may remain good in the presence of severe vascular nephritis, and that too much reliance should not be placed upon the test in this class of cases.

In a number of cases in which there was very little or no albumin in the urine and in which the patients presented no signs of uremia, but in which Rountree and Geraghty found a faulty elimination of phthalein, the patients developed uremia and died within a short time. Thus, among 58 cases there were 13 in which the total elimination for two hours was 10 per cent. or less. In 10 of this number, death occurred within two months. In view of these circumstances Roth was led to conduct some animal experiments which proved very interesting. He produced tubular nephritis in dogs by giving them bichromate of potassium and then tested their elimination of phthalein, which was invariably reduced. In the most severe cases of poisoning, no discoloration of the urine took place during the first hour. As the animals improved, their excretion became progressively better; so that it would seem that a single bad finding should not necessarily determine a hopeless prognosis, but serve rather as a guide to the actual condition of the patient. Roth also found that patients affected with severe grades of nephritis excreted more and more phthalein as their condition improved under treatment.

In the discussion which followed Roth's paper, Lohnstein¹ stated that he had used the test in more than 100 cases. He expressed the opinion that it should be made twice under the same conditions, and the results compared. In 10 cases in which such examinations were made, he did not obtain exactly the same percentage of elimination of the drug in a single case, and in only 3 cases were the results approximately the same.

In another communication, Lohnstein stated that he considers this test to be an addition to, rather than an improvement upon, the methods for determining renal function.

The same opinion was expressed by Victor Blum, who also discussed Roth's paper, and by Alexieff, of St. Petersburg, who furthermore stated that he considered it to be inferior to the phloridzin test.

Martin W. Ware² writes a long article in which he endeavors to show that the value of the phenolsulphonephthalein test has been greatly exaggerated. He maintains that the complete and rapid excretion of the drug in an unchanged form is no index to the eliminative power of the renal epithelium, and states that the non-poisonous and non-irritating properties of the drug and the small doses used are negative virtues. It seems to me that the preponderance of opinion is against the contentions of Dr. Ware.

My own experience with this test has been, on the whole, satisfactory, particularly in the determination of total function. As a rule, the results have corresponded fairly well with those given by the phloridzin test. Faulty elimination of the drug has also been accompanied by diminution in the excretion of urea. I have used this test only in surgical cases, although I have not confined it to those affecting the genito-urinary tract, but have used it as well in general surgical and gynecological cases. In the majority of the cases, both these functional tests have merely confirmed the opinion previously formed from a thorough physical examination and careful study of the patients that they were bad subjects for surgery. In this respect both proved helpful by corroborating that which had already been observed. In some cases, the tests showed that renal function was better than might be expected in view of certain clinical findings. In this respect it was assumed that they made the prognosis more favorable.

Another method of functional renal diagnosis that has aroused a great deal of discussion, particularly in France, is the *uremic constant of Ambard*. This test is based on the law of constant ratio between the quantity of urea in the blood and the square root of the quantity excreted in the urine, the weight of the body and the concentration of the urine being taken into consideration. The normal constant ratio is stated to be about 0.07. This test is very complex, and I believe it should be made only by a competent physiological chemist.

¹ Allgem. mediz. Zentralzeitg., 1913, Nos. 50, 51, and 52.

² New York Medical Journal, February 8, 1914.

Legueu¹ used it in 1200 cases, and states that subsequent experience has served only to confirm his previous opinion concerning its value. When the ratio drops as low as 0.069 or 0.056, nephritis is to be suspected. He considers this test to be superior to any other in determining the functional renal capacity of the subjects of prostatic hypertrophy. At a recent meeting of the Paris Surgical Society, the value of the test was very violently attacked by Cathelin, who endeavored to show that the statements of those who value it most highly are in themselves sufficient to condemn it. I have had no experience with this test.

A new method has been described by van Hoogenknijze,² of Utrecht, which consists in estimating the *creatinin content of the urine* obtained separately from each kidney. The advantages of this method are summarized as follows: Only 5 c.c. of urine are required to make the test. Blood in the urine does not interfere with its performance; absolute and relative values of kidney function are shown by it. The author states that the daily output of creatinin in the urine is fairly constant, and proportionate to the weight of the body, especially if the patients abstain from meats. It is principally dependent upon the albumin consumption of the tissues, as a result of which creatin is formed and converted into creatinin by the liver. When meat is ingested, the daily output of creatinin is somewhat greater, but the difference is so slight that it can be disregarded. A healthy kidney excretes, under normal conditions, at least 8 mg. of creatinin per 10 c.c. of urine. The estimation of the creatinin content is considered simple.

The author has devised a colorimeter, by the use of which an exact estimation can be made in a short time according to the clinical method of Folin. It is as follows: 5 c.c. of urine are mixed with 15 c.c. of a saturated solution of picric acid and 5 c.c. of a 10 per cent. solution of sodium hydrate; the mixture is allowed to stand for five minutes and is then diluted with 250 c.c. of water, after which the color is compared with that of a seminormal solution of bichromate of potassium. At the time the author's paper was published, this method had been used in 60 cases, 30 of which were controlled by operation. The results were so trustworthy that the test has been adopted in the Utrecht clinic to the exclusion of all others.

The *ratio of the chlorides in the blood-serum to the chlorides in the urine* has also been made a basis for determining the functional activity of the kidneys, and the term *hemorenal index* has been applied to it. Bromberg³ states that the absolute value is represented by 2; that is to say, under normal conditions twice as much chlorides are contained in the urine as are contained in the blood. If this proportion becomes diminished, it is a sign that the kidneys are not functioning normally. Bromberg states that a disturbance in this ratio takes place at a time

¹ Journal d'Urologie, January, 1914.

² Centralbl. f. Chirurgie, 1914, No. 9.

³ Journal d'Urologie, 1913, No. 5.

when it is impossible to detect disturbed function by any other method, and he enjoins performance of the test before every operation upon the prostate and bladder, and also for determining the condition of renal function during pregnancy. If the ratio falls below 1.5, he believes that surgical intervention is contra-indicated; and, if it is as low as 1, he considers the prognosis to be most unfavorable.

Bromberg has devised an apparatus for determining the hemorenal index in a very short time. The test is based upon the resistance of fluids to electrical conductivity. This is in inverse proportion to the amount of inorganic salts which the fluid contains.

These chemical tests are all more or less delicate and their performance complicated, and I believe that they should be made only by thoroughly qualified chemists. As with all laboratory methods, a great deal depends upon correct technique, and, to be of any value, one must have assurance that they are properly performed. Helpful as laboratory methods are, they will never displace a knowledge of clinical medicine and good surgical judgment.

Hematuria in Appendicitis. One of the most interesting complications of appendicitis is hematuria, which was referred to in this review two years ago. An exhaustive study recently made by Nove-Josserand¹ and Fayol has thrown much light upon the subject. It may occur in either acute or chronic appendicitis, and also as a sequel of operation for removal of the appendix. In the acute form, the hemorrhage generally comes on during, or immediately after, an attack, being ushered in suddenly without any premonitory symptoms whatsoever. The attacks are intermittent and generally of short duration, and the amount of blood passed invariable. In chronic appendicitis, hematuria generally comes on before a recurrent attack. It is common in patients who have been ailing for a considerable period, who are subject to pain in the stomach, distention, vomiting, uneasiness or pain in the right iliac fossa, and constipation. It is this form which may lead to a mistaken diagnosis of renal disease, particularly calculus, although a careful examination of the patient with reference to the character of the acute attacks, especially if supplemented by an examination of the urine and by cystoscopic examination, will do much to reveal the true nature of the trouble. Radiography likewise is most valuable in this class of cases, although it must not be forgotten that concretions in the appendix sometimes give a shadow which may be confusing. In some cases it has been impossible to pass a ureteral catheter to the pelvis of the kidney, there being an obstruction lower down, believed to be due to inflammatory exudate from the inflamed appendix. In such cases, the difficulty of diagnosis is naturally increased.

With reference to the pathogeny of this form of hematuria, the authors state that, in the majority of cases, it is referable to local conditions

¹ Journal d'Urologie, February 15, 1914.

which give rise to renal congestion. In the greater number of cases they believe that the congestion is of reflex origin, being transmitted from the appendix to the kidney through the sympathetic nervous system, although they admit that in some cases the anatomical relations of the appendix, right kidney, and ureter are such that direct transmission from the one to the other is possible when inflammatory exudate is formed. Oftentimes the appendix is situated behind the cecum, being adherent to the ureter and possibly encroaching upon its lumen.

As a rule this form of hematuria is benign, the bleeding comes on without any increased disturbance of the patient's general condition, and, so far as has been determined, the attacks leave no ill effects behind them. The authors state that no treatment, except removal of the appendix, is indicated. They report three cases which came under their own observation, and analyze 28 which they found recorded in literature.

Injuries to the Duodenum during Nephrectomy. William J. Mayo¹ contributes a valuable article on injury to the ascending portion of the duodenum during removal of the right kidney, and mentions three cases, of which he has personal knowledge, all of which terminated fatally. After a search through the literature, the author states that he has not found any similar cases reported, but he believes that the accident must have happened, and that in some cases the fistulae which formed after removal of the right kidney were really communications with the duodenum, although they were supposed to affect other portions of the intestine. The accident is attributed to the use of forceps which were applied for the control of hemorrhage. When the products of inflammation have shortened the surgical pedicle of the kidney and bound it to contiguous structures, the accident is more likely to occur than under other conditions; and it is considered especially likely in nephrectomy secondary to nephrotomy, and in the removal of carcinoma of the pelvis of the kidney. In order to prevent this complication, the author recommends the avoidance of forceps in the first effort to control hemorrhage from slipping of the ligature on the pedicle, recommending that the vessels be grasped by the fingers and tied separately instead of being clamped and tied together. The making of an adequate incision for the removal of the kidney, he believes, will considerably lessen the danger of injuring the small intestine as well as the vena cava; and, furthermore, when operating in the presence of much inflammatory exudate, he advises that the kidney be removed by means of a subcapsular operation. This technique, of course, is not applicable to removal of malignant or tuberculous kidneys. In the three cases which the author reports, the discharge of bile and pancreatic fluid produced a great deal of irritation of the skin, and in one case set up a rapidly spreading eczema which had covered the greater portion of the patient's body within a week.

¹ Journal American Medical Association, January 31, 1914.

The author asks what can be done to repair the damage when this accident occurs, and in answer to the question states that should he again have the misfortune accidentally to cause a duodenal fistula he would be inclined to open the abdomen, lift the descending duodenum from its bed, close the opening in it, cover the suture line with a flap of peritoneum or omentum, and finally make a jejunostomy for temporary feeding purposes.

Pyelitis in Infancy and Childhood. During the last few years specialists in the diseases of children have given considerable attention to the study of urinary infection in infancy and early childhood; but, despite this fact, one is led to believe that the average general practitioner, whose work constantly brings him in contact with babies and young children, does not sufficiently understand the condition. At the meeting of the British Medical Association a few years ago, Hale White, in discussing the diagnosis of fever without physical signs, remarked that the cause of many an obscure pyrexia in childhood had escaped detection because of neglect to make a careful bacteriological examination of the urine.

In a recent communication, Cheinisso,¹ of Paris, expresses the same opinion, and mentions a case, to which he was called in consultation by an excellent physician, in which the patient, a child of seven months, had been running an intermittent fever for two weeks, without presenting any physical signs to account for it. Examination of the urine was made with the result that the child was found to be suffering from pyelitis.

Although attention was first called to this form of urinary infection in children by Escherich, in 1894, he considered it to be cystitis; and it was our own Emmett Holt who, in the same year and only a few months after Escherich's contribution was made, reported, at the third meeting of the Congress of American Physicians and Surgeons three cases which he described as pyelitis, thereby placing the condition upon a correct pathological basis.

As to the pathogenesis of this form of pyelitis, it was at first believed that the infection was an ascending one, and some strength was lent to such a view by the fact that the greater number of cases occurred in female children. Later statistics, however, showed that male children were by no means exempt, and in Goeppert's cases from 10 to 11 per cent. of little boys were infected. Goeppert remarks that the disease is met with generally among the children of the very poor, in whom uncleanness might favor the belief that the infection was originally a local one, particularly as it occurs most frequently in the summer when maceration of, or abrasions upon, the skin in the region of the external genital organs are most likely to take place. With our increased knowledge concerning renal infections, the ascending form has been found to be much

¹ *La Semaine Médicale*, December 3, 1913.

less common than was formerly supposed, and I am inclined to believe that it plays no more important role in the infections of infancy and childhood than it does in those of adult life. If it be borne in mind that gastro-intestinal disorders are much more common in infancy and childhood in summer than they are at other seasons of the year, and the possibility of absorption of toxins from the bowels, the occurrence of renal infection through the blood-stream or lymph channels will be more readily understood. The latter avenue of infection has assumed more importance, and offers a more satisfactory explanation, since the relations existing between the lymphatics of the cecum and descending colon and those of the right kidney have become better understood. Furthermore, the occurrence of this form of pyelitis as a complication or sequel of such acute infectious diseases as scarlet fever and diphtheria points to a hematogenous origin. Urinary intoxication has also been considered responsible for the trouble.

During the last year four important contributions to this subject have come to my notice. Cheinisse, to whose paper reference has already been made, describes the symptoms very clearly. Systemic disturbances dominate the symptom-complex. In very young children there is high fever and great restlessness, and oftentimes convulsions, which may lead one to think of meningitis; the child refuses to take nourishment, vomits, and develops a mucus diarrhea. If he survives for a number of days, great emaciation is noticed, and the expression denotes acute suffering, the face being drawn, pinched, and often jaundiced. Chills are not uncommon, and, since they do not often occur in children under two years of age, the author considers their occurrence of considerable diagnostic significance. The type of fever may resemble that of typhoid. If the disease is prolonged into its chronic state, the symptomatology is that of a severe enteritis or even an advanced tuberculosis. In children more than two years old the manifestations are not so violent. The absence of any local signs is of diagnostic importance; in the majority of cases they are wanting. Naturally, an examination of the urine will throw light upon the cause and nature of the trouble, and it is highly desirable that doctors bear in mind the possibility of pyelitis in little patients presenting the symptom-complex above mentioned.

Another article has been written by Langstein,¹ of Berlin. Of the large number of cases which have come under his observation in hospital practice during the last five or six years, many have occurred as a complication of the acute infectious diseases, influenza being the most potent factor in its production. Whooping cough likewise was responsible for a considerable number, and scarlet fever gave rise to some. In two cases Hirschsprung's disease was accompanied by pyelitis. The author is in doubt as to the pathogenesis of the renal infection. The

¹ Med. Klinik, 1913, No. 37.

form most to be dreaded, however, he considers to be of toxic origin. In the summer of 1911 this form was especially prevalent, affecting, for the most part, nursing children who presented the symptom-complex of an acute intoxication, and in whom high fever, vomiting, and rapid loss of weight were associated. Some lapsed into unconsciousness and died. These children had been given no nourishment except mother's milk, and while apparently in good health were suddenly taken ill and rapidly developed the symptoms above mentioned.

In discussing Finkelstein's theory that urinary intoxication is the cause of this form, the author feels that, while it may satisfactorily explain some cases, it fails to offer an adequate explanation for the pathogenesis of others. He thinks that some children suffer from a deficiency of fluid (wasserhunger) which produces inanition, and thus renders them susceptible to infection.

The prognosis he considers uncertain, although in 90 per cent. of cases in which a correct diagnosis is made early and proper treatment instituted, a favorable outcome is to be looked for. Naturally, in neglected cases, or those that do not respond to treatment, involvement of the parenchyma of the kidney will render the prognosis more serious. Among the author's cases were a number in which this complication occurred.

As to treatment, he believes that the most important thing to do is to flush the kidneys by giving the children large quantites of water, especially in cases of toxic origin. This simple treatment has proved most beneficial, frequently producing striking results.

He also advises that the children be fed generously so that their strength may be increased. Although the author formerly believed that urotropin possessed a high degree of efficiency in the treatment of these cases, he has come to the conclusion that salol, in doses of from 0.6 to 1 gram, is more efficacious. The effect of vaccine was disappointing.

In the years 1911 and 1912 pyelitis and pyelocystitis were surprisingly common in the Children's Hospital at Freiburg, comprising not less than 5 per cent. of all admissions. Only 5 per cent. of the total number of cases treated occurred in males. This material has been made the subject of a study by Wodrig.¹ The majority of the patients were affected with constitutional symptoms, only a few showing any urinary disturbances. In those cases which terminated fatally, the pathological tissue-changes found at autopsy were not at all commensurate with the severe clinical manifestations of the disease and with the changes in the urine. It is encouraging to learn that the prognosis based upon this series is better than that usually given. The mortality rate during both summers varied from 4 to 5 per cent. Of the male children only one died, and he succumbed to tuberculosis. This circumstance would tend to show that the disease is not nearly so fatal in male infants as has gener-

¹ Freiburg Dissertation, 1913.

ally been considered. It is interesting to note that recovery took place in three cases which at one time seemed bound to terminate in death. In common with Langstein, the physicians of the Freiburg Clinic are advocates of liberal feeding, and their treatment consisted not only in the free administration of water and the rational use of urinary antiseptics, but also comprised the giving of as much milk as the children could digest.

Elterich,¹ of Pittsburgh, states that he has seen 19 cases during the last two years, all of which were in female children whose ages varied from seven and a half months to eight years. In all the acute cases the duration of the fever was from three to six weeks. In one case, the temperature ranged from 103° F. to 106° F. for nearly three weeks, although there was very little prostration and the child lost only one pound in weight. Neither chills, severe nervous symptoms, nor convulsions occurred in any of the cases. The author states that one of the chief reasons for reporting his cases is to make a plea for a more careful and routine examination of the urine of young children.

Hydronephrosis. Beside the ordinary causes of hydronephrosis, such as movable kidney, injuries of the kidney and ureter, neoplasms, stricture of the ureter, narrowing of its lumen by the pressure of uterine or ovarian tumors, other conditions, such as anomalies in the formation of the ureter, either in the pelvis of the kidney or near the bladder, may play an important etiological role.

Michailov² has reported an interesting case in which the ureter had become dilated at its proximal end and projected into the pelvis of the kidney so that it formed an obstacle to the evacuation of urine. The kidney itself was atrophied and much softened, and its pelvis was greatly dilated. The protruding portion of the ureter was excised, and each one of its roots tied with catgut. The margins of the incision made in the pelvis of the kidney were sutured to the skin with silk. Beginning a few days after the operation, the pelvis of the kidney was washed out several times with a solution of collargol. At the end of two weeks a plastic operation was done to close the fistula. Two months later this patient was perfectly well.

In discussing hydronephrosis, J. W. Thompson-Walker³ points out that there are some cases in which no cause whatever can be found, and that it is only at operation that a congenital stenosis or valve formation at the junction of the pelvis of the kidney and ureter, or an anomalous artery which has produced pressure upon the ureter, reveals the cause of the obstruction. He recognizes the existence of two distinct groups of cases; one dependent upon such causes as those just mentioned, and the other due to a renal calculus or a movable kidney. In the cases due to

¹ Pennsylvania Medical Journal, July, 1914.

² Journal russe des maladies cutanées et vénériennes, January, 1914.

³ Annals of Surgery, December, 1913.

calculus, the pain assumes the type of that caused by renal colic, and, in fact, the patient has generally had several attacks of the latter affection. As these attacks become less and less frequent, the patient gradually becomes accustomed to the discomfort due to the presence of the stone, and feels less inclined to undergo an operation for its removal. The author considers the lengthening of the intervals between attacks of colic, and the diminution of the pain when they do occur, as a sign of dilatation of the ureter and pelvis of the kidney. He believes that the renal pelvis becomes less and less sensitive as dilatation progresses, until finally an enormous dilatation may be present without causing any pain whatsoever. He also believes that the musculature of the renal pelvis and ureter is destroyed by the pressure exerted upon it, consequently the muscular spasm which gives rise to renal colic becomes less and less pronounced. Constant pain is considered a sign of beginning dilatation. It may not be present, however, and of course may also be due to other causes.

A New Method of Exposing the Lower End of the Ureter. E. S. Judd,¹ of the Mayo Clinic, reports a method which he has found very useful for exposing the vesical extremity of the ureter. He had occasion to use it during an operation for a vesical diverticulum which had an orifice 15 mm. wide, and opened immediately in front of the left ureteral meatus. The bladder was opened by the usual suprapubic incision, and exploration of the diverticulum begun for the purpose of determining its relations to the ureter. As no satisfactory knowledge could be acquired through this incision, the author decided upon further exploration. An assistant lifted up and made strong traction upon the left half of the bladder, thereby exposing its external surface. A detachment from the surrounding structures was then carried on by blunt dissection until the left ureter had been exposed for a distance of 5 or 6 cm. This mobilization of the bladder and ureter made it easy to dissect away the diverticulum and remove it. The wound in the bladder was sutured and drainage established. The author has used this method in five other cases and has found it very satisfactory.

THE BLADDER.

Tumors. Hugh Young² contributes a study of vesical neoplasm based upon 118 cases, of which 17 per cent. were benign papillomata and the remainder malignant. Of the latter class, all but one were carcinomata, the exception being a sarcoma. The most striking thing about this series of cases is the relative rarity of benign growths. These tumors become malignant almost always if they are not removed comparatively early in the course of their evolution, and, as is well known, their removal

¹ Annals of Surgery, March, 1914.

² Journal American Medical Association, November 22, 1914.

is often followed by malignant recurrence. All of the malignant neoplasms in this series were primary growths of the bladder, not secondary to carcinoma of the prostate. Young believes that primary malignant growth in the bladder is the rule, despite the contentions of some authors to the contrary. Treatment applied to these cases comprised excision through the suprapubic cystotomy incision, which was done in 47 cases; fulguration, which was practiced in 19 cases; suprapubic drainage, 32 cases; partial excision through a suprapubic opening, together with the destruction of the base of the tumor by fulguration or the use of a cautery, 5 cases; no treatment except palliative, 38 cases. Young's conclusions may be summarized as follows: Early diagnosis is essential. One must not wait for the occurrence of hemorrhage to make a cystoscopic examination. Excision, as ordinarily practiced, is followed by recurrence whether the neoplasm be benign or malignant. In the treatment of benign papilloma, the high frequency current gives satisfactory results. In malignant cases, resection of the neoplasm together with a large area of healthy bladder wall, supplemented by transplantation of the ureters if necessary, and excision if a tumor has developed in a part of the bladder in apposition with this membrane, is recommended. The application of a 50 per cent. solution of resorcin or of alcohol, or, better than either of these, cauterization of the tumor before its removal, is advised in order to prevent transplantation of carcinoma cells during operation. The intra-peritoneal method of approach is considered advantageous only when the tumor involves the superior or posterior vesical wall. In cases apparently hopeless, destruction of the tumor at its line of demarcation from healthy parts by means of the thermo- or galvanocautery has given unexpectedly favorable results.

Treatment of Vesical Tuberculosis by the High Frequency Current. At the last meeting of the French Urological Association, Heitz Boyer¹ called attention to the treatment of vesical tuberculosis by the high frequency spark. He stated that the indications for this method exist only in a very small percentage of cases, but that in those in which the method is applicable excellent results are obtained. In some cases in which vesical disturbance persists after nephrectomy, it will be found to be due to the failure of tuberculous ulcerations of the bladder to heal, rather than to the persistence of secondary cystitis superimposed upon the original tuberculous lesions. It is in cases of the former kind that the author recommends the use of the high frequency current. The technique of its application is the same as that used for the destruction of small sessile tumors or for the removal of the stump of large pedunculated growths, although in treating tuberculous ulcers it is considered necessary to destroy an area of tissue extending a centimeter beyond the limit of the ulceration (Fig. 32). The treatment is painful, and, in some cases, a general anesthetic will be required. The duration of the applica-

¹ Journal d'Urologie, February 15, 1914.

tion varies according to the extent of the ulceration, but it must always be borne in mind that the bladder wall may be much thinner than the normal, consequently the effect of the spark must be carefully watched. This is particularly true when the ulcers are situated upon the superior wall. There is not much after-pain. Repeated cystoscopic examinations, made at varying periods after the treatment, have enabled the author to watch the action of the current upon the tissues. A violent inflammatory reaction, with sloughs, is first produced, this being followed by the proliferation of epithelium which covers the surfaces denuded by the casting-off of masses of tissue. Cicatrization is not complete until the end of the fourth week. The urine gradually clears up as the painful phenomena disappear. An interesting case is reported in detail.



FIG. 32.—Showing the line application through healthy tissue.

Collargol in the Treatment of Cystitis. Brebing¹ has used intravesical injections of collargol with much success in the treatment of cystitis. He first washes out the bladder with a 3 per cent. solution of boric acid, and then injects 100 c.c. of a 1 per cent. solution of collargol, which the patient retains as long as possible. He has never had patients complain of severe pain after the injection. He states that in acute colon bacillus cystitis the results of this treatment are remarkable, and much more satisfactory than those which follow injections of iodoform oil. The fever falls rapidly, and the general condition of the patients improves. The injections may be given every day if desired. Acute gonorrhreal cystitis has also been favorably influenced by the use of collargol.

Resection of Diverticula of the Bladder. Marion² reports a case in which he successfully resected a diverticulum of the bladder by a method which he considers to be especially adapted for the removal of posterior and lateral diverticula. The case in question was one of a young man,

¹ Deutsch. Med. Wochenschr., 1913, No. 38.

² Journal d'Urologie, November 15, 1913.

aged eighteen years, who was found to have a diverticulum on the right lateral wall of the bladder, the orifice of which was as large as a five-franc piece. The technique which the author recommends is as follows: If possible, the ureter of the side upon which the diverticulum is situated is catheterized, then the bladder is opened by a suprapubic cystotomy incision, and the vesical wall on the affected side is completely separated from all the perivesical tissues. The detachment is best effected by blunt dissection with gauze, the bladder being held up by means of traction sutures introduced through the sides of the incision. No harm is done if the peritoneum is opened. It is closed by suture, and as soon as the separation of the bladder is complete, the line of closure can be protected with a sponge. Separation of the vesical walls is carried down to the point at which diverticulum and bladder unite. The next step is to split the bladder wall down as far as the orifice of the diverticulum, whereupon it will be easy to introduce one or more fingers through the orifice and make traction upon it, just as is done upon the sac of a hernia, at the same time separating its external surface from the surrounding tissues. The ureter is the only structure that is in danger of being injured by the process of separation, and when it has been possible to introduce a sound within it, the danger is very much reduced. When the diverticulum has been completely separated, it is attached to the bladder only by a pedicle corresponding to the orifice of communication between the two cavities. Its removal is then accomplished by dividing the pedicle. The opening in the bladder wall is closed by a double layer of catgut sutures. If the ureter has been divided, it, of course, must be reimplanted in the bladder. The cystotomy incision is partly closed, the drainage tube introduced, and the superficial wound then sutured with the exception of its lower portion, through which the space of Retzius is drained. In the author's case there were no postoperative complications. The operation was performed January 28, 1913. A cystoscopic examination made in the middle of March showed a firm scar at the site of resection. Two months later the patient was seen again, and his condition was normal in every way.

Operation for Congenital Diverticulum of the Bladder through the Perineum. Operation for congenital diverticulum of the bladder through the perineum is advised by Kruter,¹ of Erlangen. He has obtained a very satisfactory result by the method. The case was that of a man, aged sixty-three years, who had suffered for two and a half years from retention of urine associated with cystitis. As cystoscopy was impossible on account of the irritable condition of the bladder, a suprapubic section was performed. The prostate was found to be normal, but just external to the left ureteral orifice the opening of a diverticulum was found; the sound, passed within, showed that it was deep. A finger introduced into the rectum located the end of the sound six centimeters beyond the anus. The

¹ Zentralblatt f. Chirurgie, November 9, 1913.

diverticulum was drained through the suprapubic wound. A second operation was performed through the perineum some time later by means of the curved incision of Zuckerkandl. The rectum was separated from the prostate at the base of the bladder, and the diverticulum thus isolated was found to be as large as an adult fist. It was extirpated without any injury to the perineum, and the bladder was carefully sutured. At the end of a month the patient left the hospital, having at that time a small suprapubic fistula which closed spontaneously a few days later.

THE PROSTATE.

Prostatectomy. In discussing the factors influencing the mortality of suprapubic prostatectomy, Hugh Cabot states that better methods of controlling hemorrhage will undoubtedly reduce the mortality rate, and expresses the opinion that sufficient attention has not been paid to this subject.

While the occurrence of hemorrhage from the periprostatic plexus has been well understood, the author believes that the importance of arterial bleeding has not been sufficiently recognized. Since he has been using a long incision in the bladder wall, he has had ample opportunity to observe spurting vessels in the upper portion of the wound where masses had been separated from the musculature of the vesical neck. For the control of this arterial hemorrhage he has employed a suture which is introduced upon a small curved needle carried down into the cavity from which the prostate had been enucleated, and then brought out through the arterial wall close to the pubic bone, being made to include all the muscular structures. The end is then carried down toward the floor of the bladder as a continuous suture, which is stopped just short of the middle line. Another is introduced in exactly the same way on the opposite side. These sutures serve to pucker the vesical neck. It has been found that when there is considerable laxity of the tissues, more or less diaphragm formation will result, and when this occurs the diaphragm should be divided either with scissors or the cautery. Packing has not been found necessary when such a method of suturing has been employed. The author states that further experience may simplify the method, and that some other plan of suturing may prove to be superior to the one which he has thus far used.

Another factor influencing the mortality to which the author¹ calls attention is traumatic operation. There can be no doubt that rough manipulation and unnecessary injury have caused a fatal ending in many cases which might have been counted among those successfully operated upon had more gentle methods been employed.

¹ Transactions American Association of Genito-urinary Surgeons, 1913.

C. L. Gibson¹ operates with the patient in the horizontal position on a low table, 24 to 26 inches high. This position, he states, brings the weight of part of the operator's body down on the abdominal wall, depressing it, and thus rendering enucleation of the prostate easier.

Legueu² states that he refrained from using local anesthesia for prostatectomy until he felt that he was capable of doing the entire operation under its influence. He recently reported 16 cases which he had done within a month, and in which he obtained very favorable results. His technique is of interest with reference to the production of analgesia in the tissues from which the prostate is enucleated. The production of analgesia in the bladder is the first step of his special method. He injects from 8 to 10 c.c. of a one-half per cent. solution of novocain, to which a small quantity of adrenalin is added, directly into the vesical wall before incising it. After the bladder has been opened, two fingers of the left hand are passed into it and the prostate is examined with the utmost delicacy. From 5 to 10 c.c. of the same solution are then injected around the gland by seven or eight punctures. For this purpose the author has devised some special needles which are from 20 to 30 cm. long, very strong, and having different curves and angles. To inject around a large protruding lobe a needle having a large curve is necessary. To reach the sides and front of the gland a short needle bent at a right angle is useful. The injections are made slowly, the point of the needle being guided by the two fingers previously introduced into the bladder. If the point penetrates into the substance of the gland, a sense of resistance is encountered when pressure is made upon the piston, and it becomes necessary to change the site of injection. When the needle is in the plane of cleavage, the liquid penetrates easily. After the entire periphery of the prostate has become anesthetized, two injections are made into the intraprostatic urethra, so as to anesthetize the region in which the urethra will be torn during enucleation of the gland. The total quantity of novocain used varies from 0.6 to 0.8 egm. Only one disadvantage of this method was observed in the 16 cases which the author reported, and that was the production of sloughing in the soft parts, the skin, and the subcutaneous and perivesical tissue. The author believes that this would not occur if the operation could be made absolutely aseptic, but in an operation in which the wound is left open, and is contaminated with urine and otherwise exposed to infection for three or four weeks, he thinks that it will be inevitable in some cases. It occurs to me that sloughing would be less liable to take place if adrenalin were left out of the solution.

The Diagnostic Value of Eosinophilia in Surgical Diseases of the Prostate. In May, 1913, Morel and Chabanier³ called attention to the existence of eosinophilia in the subjects of hypertrophy of the prostate. Since that

¹ Medical Record, August 22, 1914.

² Journal d'Urologie, June 15, 1914.

³ Frankfurter Zeitschr. f. Pathologie, 1914, No. 1.

time Legueu and Morel have continued to study this phenomenon and have endeavored to utilize it clinically. They report the results of leukocyte examination made upon eighty-five patients who were affected with different diseases of the prostate. Their first group comprised forty men having prostatic adenoma. Irrespective of any septic complication, these patients showed a slightly increased leukocytosis, the average being 12,000. In 90 per cent. of the number the eosinophiles were above normal, the average being 5 per cent. in contradistinction to 2 per cent., which is the normal proportion. Eosinophilia disappears after the gland is removed. It is supposed to be due to a local reaction in the prostatic urethra. Verliac, who examined sections of prostatic adenomata, found eosinophiles disseminated in the suburethral zone.

The blood of 31 patients having carcinoma of the prostate was examined. It showed only 0.4 per cent. of eosinophiles with a superabundance of polynuclear cells; namely, 87 per cent. Thus it is seen that the blood-picture is decidedly different from that given by the subjects of prostatic hypertrophy. The authors believe that this difference may be of some clinical value in enabling one to make a differential diagnosis in cases in which carcinoma is suspected, and that it will almost invariably confirm the clinical diagnosis of cancer.

Cancer of the Prostate. Freyer¹ has contributed an article on this subject based upon the private cases which had come under his observation in the last eleven years. Out of 1276 cases of hypertrophy there were 171 in which malignant change had taken place. He refers to the symptoms, diagnosis, and treatment of the condition from the experience acquired in this series of cases. The urinary symptoms are exactly the same as those presented by simple hypertrophy, and do not differ at all in their manner of development. When a patient gives a history of such difficulty, and states that it has come on rapidly within a few months, cancer is to be suspected, and this is particularly the case if the patient be under fifty or above seventy. If the urinary disturbances have been accompanied by progressive loss of weight, a gradually increasing weakness, and pain in the back, thighs, perineum, urethra, and buttocks, the reason for suspecting malignant disease becomes stronger. It has been Freyer's experience that hemorrhages are not common, and he states that they rarely occur except when the prostatic urethra has been invaded by a neoplastic growth.

The first step in the examination of these patients consists in catheterizing them. If a blunt resistance is met in the prostatic urethra, the inference is that its walls are infiltrated and consequently not depressible. Upon rectal palpation, the prostate is found to be very hard, although occasionally softened areas can be detected which are due to breaking down of the tumor. Outlines of the gland are irregular, its lobes not distinctly defined, and the median furrow between them either indis-

tinct or obliterated. Although the surface of the gland is generally nodular, the author has found cancerous prostates that were perfectly smooth. The most important sign found upon palpation is immobility of the gland, which has become firmly fixed to the adjacent tissues. In advanced cases, the lymph nodes which drain the region of the prostate are invaded.

Freyer advises against the use of the cystoscope, as its passage is both difficult and painful, and he considers that not enough can be learned by it to warrant its use. As a rule, he has found the disease too far advanced to perform a radical operation. He advises that patients be catheterized as long as possible, and then that a suprapubic cystostomy be performed. Pain is to be controlled by the free administration of opiates. Radiotherapy is considered practically useless.

The length of time which patients having cancer of the prostate survive is extremely variable. Some of Freyer's patients died after a few months; others lived a number of years. Cancer of the prostate developing irrespective of hypertrophy is considered almost absolutely inoperable, for the reason that it does not produce symptoms until the capsule has been broken through and the adjoining tissues invaded. On the other hand, if an hypertrophied prostate begins to undergo malignant degeneration, the occurrence of the change may be suspected by the rapid exacerbation of the ordinary symptoms and the detection of small nodules on the surface of the gland. Under such conditions the results of enucleation are relatively good, because the neoplasm can be removed while it is still confined to the prostate itself. Gratifying results are recorded in eight cases of this kind. In those cases in which the capsule and the adjoining tissues had already become involved, recurrence took place. Despite the dubious outlook in such cases, the author advises operation in every instance in which enucleation is considered feasible, for it may be possible to remove at least enough of the cancerous tissue to prolong the patient's life for some time and to delay the advent of the time when suprapubic drainage shall become necessary.

An extensive communication upon the same subject has been made by Young,¹ of Baltimore. He likewise attributes the greatest diagnostic importance to the finding of stony induration upon palpation of the gland, whether it be present in the form of isolated nodules or involve the greater part, or the whole, of the gland. A careful study of approximately 200 cases of prostatic carcinoma shows that the tumor does not have a tendency to grow into the bladder, in this respect, also, corresponding to Mr. Freyer's observations. Young furthermore states that ulceration of the rectum occurs in extremely few cases, and then only very late in the disease. He aptly remarks that the fascia of Denonvilliers is probably responsible for limiting the spread of the neoplasm to the rectum.

¹ American Journal of Urology, June, 1914.

The author presents an analysis of 6 cases in which his radical perineal operation was performed. The ages of the patients were seventy, sixty, four, sixty-five, sixty-four, seventy-five, and sixty-eight respectively, and symptoms had been present eleven months, three years, four years, one year, eight months, and one year respectively. In all these cases sufficient symptoms had been present to warrant rectal examination, by which a much earlier diagnosis could have been made. Two patients have apparently been cured; one died six and a half years after the operation; the other is well four years afterward. In view of his experience, the author concludes "that operation should not be undertaken in cases in which the infiltration extends more than a short distance beneath the trigonum; nor when the upper portions of both seminal vesicles are involved; nor when an extensive intervesicular mass of indurated lymphatics or glands or involvement of the membranous urethra or muscle of the rectum shows that the disease is manifestly too far progressed." He states that only three of the six cases which he reports were suitable for radical operation, and that, in all of these, disease was, apparently, completely arrested. He also reports two cases of cure in which small nodules of cancer were completely removed in the course of perineal prostatectomy for supposed benign hypertrophy.

THE PENIS AND URETHRA.

Carcinoma of the Penis. In reviewing 30 cases of carcinoma of the penis, which occurred in his service at the Johns Hopkins Hospital, Hugh Young¹ first calls attention to the change in surgical opinion which has taken place during the last few years concerning the treatment of this affection, pointing out that complete emasculation, which superseded the practically useless partial amputations formerly practiced, had in turn given way to a more rational operative technique. He states that in those cases in which simple amputation was performed without removal of the corpora cavernosa, recurrence took place in the groin, the stump itself remaining free. So, also, in those cases in which amputation was supplemented by removal of the inguinal lymph nodes, recurrence still took place in the groin or even deeper. The author holds the opinion that the best operation consists in removal of the penis, the suprapubic fat and the inguinal lymph nodes on both sides, together with the fat and soft tissues of the groin. These parts are removed in one piece. The inguinal incision is begun near the anterior superior spine of the ilium on each side and carried well down toward the root of the penis. The removal of tissue is begun at the external part of the incision so that the deep lymphatics connecting with the body are divided first, thus reducing the danger of forcing cancer cells into the general lymphatic system. Poupart's ligament is followed downward to the region of the saphenous

¹ American Journal of Surgery, August, 1914.

opening, and the glands around this area are removed. Then the incision is extended downward a short distance into the scrotum and also carried toward the symphysis pubis, dividing the suspensory ligament which is removed, together with the more superficial tissues. In this manner the author believes that it is possible to remove the entire lymphatic system from the neoplasm to each groin. He considers the prognosis for such a technique extremely good, even though diseased lymph nodes are found. He states that some of his patients have remained well more than ten years, and that the functional result of this operation is much better than would be expected in view of the extensive removal of tissue, as patients in whom the penis had been removed close to its base report that they are still able to culminate the sexual act. Of the 30 cases reported, 11 seemed hopeless at the time of operation, and in all these cases only a very simple operation was done. Three of these patients are known to have succumbed to acute infections. Out of the 30 there are 13 which are apparently completely cured. The author¹ also calls attention to the etiological importance of redundant and tight prepuce in cancer of the penis. This only serves to emphasize the advisability of circumcising all male children and all adults who have long, tight foreskins.

Lesions of the Posterior Urethra. Since instruments for examining the posterior urethra have been brought to such a high degree of mechanical and optical perfection, renewed interest has been manifested in lesions of this part of the genito-urinary tract. An effort has been made to correlate a whole series of more or less vague symptoms of which patients complain with the presence of changes in the veru montanum and other parts of the prostatic urethra. Numerous contributions have been made to this subject during the last few years, and in previous reviews the studies of Hawkins, Burger, and Luys have been referred to.

That alterations in the structures found in the prostatic urethra may give rise to genital and urinary disturbances was a matter of common knowledge long before the invention of any satisfactory instrument for visual examination. Seventy-five years ago Llallemand wrote enthusiastically upon the treatment of a whole train of sexual disturbances in the male by cauterization of the deep urethra, and his porte caustique was used for several decades by surgeons in many countries. Despite the abuses of this instrument, it is not to be doubted that good results were sometimes obtained by its judicious employment. The porte caustique gradually ceded to the deep urethral instillator, and pure nitrate of silver gave way to solutions of varying strength, mild ones generally being employed. The Keyes-Ultzman instillator constituted a part of the equipment of every genito-urinary surgeon, and was also frequently found in the instrument case of the general practitioner who was called upon to treat urethral diseases. Good results obtained by the use of this

¹ American Journal of Surgery, August, 1914.

instrument are undeniable. Whether the revival of treatment of deep urethral lesions by applications of strong silver solutions, controlled by visual examination of the parts through the newer posterior urethrosopes, will be productive of greater good than older methods judiciously employed remains to be determined. Certainly the newer methods are more exact in that they permit direct applications to the veru montanum itself; they also make possible a more accurate use of electricity, and likewise have rendered the orifices of the ejaculatory ducts and the ducts themselves amenable to direct treatment. In this respect they must be considered as a decided advance.

Too much reliance, however, is not to be placed upon improvement following such manipulations as the destruction of small cysts at the vesical neck, dilatation of the ejaculatory ducts, or even cauterization of the veru montanum. If the disturbances of sexual function be considered, it must be admitted that there is a certain class of patients who are first, last, and all the time neurasthenics, and who require psychotherapeutic treatment quite as much as they do urethral applications. It is possible that the experienced physician may do better with this class of patients than the urethroskopist, although to consign such patients exclusively to one or the other would certainly do injustice to some patients, whichever medical man should be selected. If the history of such patients can be accurately obtained, it will often be found that many of them have lived irregular sexual lives, being addicted to excessive interrupted intercourse, or to indulgence in unnatural practices. Many of them also use alcohol to excess. Certainly in cases of this kind it would seem that whatever alterations have taken place in the veru montanum, as revealed by the posterior urethroscope, have been caused by the vicious habits of the patients, instead of having occurred as primary lesions which are the cause of the symptoms from which the patients seek relief. Naturally, in such cases, little is to be expected from local treatment unless the underlying causes are removed and the general condition of the patient improved. That a few applications of silver to the congested veru montanum is helpful in some of these cases has been the reviewer's experience, although he has found supplementary treatment directed to the general condition, the morale, and, incidentally, to the morals of the patient, also valuable in restoring them to health.

J. Leyberg,¹ in an exhaustive study of this subject, reaches practically the same conclusion, although he believes that a urethrosopic examination should be made in every case of the kind and that the patients should not be entrusted exclusively to the neurologists for treatment. This point is certainly well taken.

Chronic gonorrhea is likewise responsible for many changes in the posterior urethra, and endoscopic examination will often show the veru montanum to be swollen and edematous, or reveal the presence of granu-

¹ Zeitschr. f. Urologie, June, 1914.

lations or small polypoid masses. When such conditions exist, experience teaches that many discharges can be suppressed almost as though by magic by the removal of these little tumors and the application of a 20 per cent. nitrate of silver solution through the endoscope. The reviewer's experience with this class of cases has been more satisfactory than with those of the kind referred to above.

Max Roth and Theodore Mayer,¹ of Berlin, have examined a series of patients thus affected and have found either granulations or polypoid tumors in one-third of them. In approximately one-fifth of the cases, pure polypi were present. It is interesting to note that in another series of cases in patients who had had posterior urethritis, but who had completely recovered, similar lesions were demonstrated. Furthermore some were found in patients who had never had gonorrhea. This circumstance serves to accentuate the importance of not attributing all the difficulties of sexual function to the presence of papillomata or cysts in the posterior urethra or at the vesical neck. With reference to contraction of the ejaculatory ducts, the authors state that they do not believe it to be responsible for any form of impotence, and they doubt that the good results reported from dilatation of the ducts depend upon anything except the mental impression which it produces. In some of their cases hemospermia yielded to the same treatment which they employed for the suppression of chronic urethral discharges.

Another important contribution to the subject of urethral polypi has been made by Alexander Randall,² of Philadelphia, who has studied the histology carefully and endeavored to make a better classification. He divides them into three types: the pure type or benign fibrous polypi; the villous type or benign villous polypi; the glandular type or benign glandular polypi. The first form constitutes the simplest tumor growth, being made up of fine network and suppurating thin-walled vessels. It is the analogue of the pure form of caruncle found in the female urethra, and, like the latter, is probably the most common form affecting the male urethra. The second type shows papillary proliferation, the stroma being the same as that of the first type. The author states that the glandular type has been reported by only three other observers, and quotes Burckhardt, who records 5 cases. He believes these tumors to be prostatic in origin and that they represent early benign hypertrophy occurring in a tuft of aberrant prostatic tissue. He reports a number of cases in which very satisfactory results were obtained by removal of these various types of growths.

Iodine in the Treatment of Gonorrhea. During the last few years various contributions have been made to the subject of the iodine treatment of specific and simple urethritis, and a number of iodine compounds have been placed upon the market and lauded highly as additions to the thera-

¹ *Zeitschr. f. Urologie*, January, 1914.

² *Surgery, Gynecology, and Obstetrics*, November, 1913.

peutic armamentarium of the genito-urinary surgeon. As a matter of fact, there is nothing new in the use of this drug in the treatment of specific urethritis, for as long ago as 1856 the late Samuel D. Gross recommended an injection composed of 10 drops of tincture of iodine and a few drops of glycerine in an ounce of distilled water for use in the subacute and chronic stages of the disease. A decade ago the late Dr. Charles C. Hunsicker, of Philadelphia, reported excellent results from a mixture of iodine and argyrol.

Among the recent articles dealing with the subject is one by Motz,¹ in which iodine and its preparations are highly recommended in the treatment of persistent urethritis. He makes an application of the full strength tincture to localized areas of inflammation in both the anterior and posterior urethra, using the urethroscope to detect the diseased areas. The applications are not made oftener than once a week. Instillations of iodine in 60 per cent. alcohol, combined with a small quantity of potassium iodide to render the iodine more soluble, he also found useful. *Lytinol*, a complex compound of iodine, benzol, and aluminum, gave very good results in non-specific affections. It was used as an injection in the strength of 30 per cent., 4 c.c. of such a solution being retained in the urethra for two or three minutes. A 5 per cent. or 10 per cent. solution may also be sealed into the urethra and allowed to remain two or three hours in cases in which a prolonged action of the drug is desired.

Baumer,² of Berlin, also reports gratifying results from the use of this preparation in cases of simple urethritis, also in persistent chronic inflammation following gonorrhea. He believes that it destroys hypoplasia of the mucosa and also submucous infiltrates, transforming the deeper lesions into superficial ones which yield readily to the action of astringents. The first effect which he noted was marked increase in the discharge. Microscopic examination made twice daily in one series of cases showed large numbers of leukocytes with decreasing numbers of bacteria. In all cases the discharge diminished after two or three weeks' use of the drug, the leukocytes disappearing gradually and finally being replaced by epithelium. It is in this stage that the use of astringents is begun.

Two papers dealing with the use of iodine in the treatment of gonorrhea in the female also came to my attention. H. J. Hartz,³ of Philadelphia, reports very favorably upon the drug for this purpose. He uses it in aqueous solution in acute and subacute cases of vulvitis and vaginitis, the patient being given a douche twice daily consisting of a teaspoonful of Lugol's solution in two quarts of warm water. In chronic cases, the strength of the solution may be gradually increased to 2 teaspoonfuls to 2 quarts of water. When the cervix was involved, full strength Lugol's

¹ Rev. Clin. d'Urologie, January, 1914.

² Zeitschr. f. Urologie, 1914.

³ American Journal of Obstetrics, April, 1914.

solution was applied to the cervical canal by means of an applicator wound with cotton. When such applications were not effective, a saturated solution of iodine crystals in 95 per cent. carbolic acid was substituted, and was found very efficacious. The same strong solution was used to destroy the mucous membrane of the ducts of Bartholin's glands, and in one case was applied with favorable result to the ducts of Skene's glands. In cases of chronic urethral inflammation in the female, dilatation with Hegar's dilators, followed by instillations of iodine in albolene, 5 grains to the ounce, was found very helpful in bringing about a cure. Finger's ointment was also used in some such cases. Of 25 cases treated by this method, 18 were cured in the clinical sense of the word in from 4 to 10 weeks. The author states that the term "cured" is used to denote absence of gonococci from the secretions, amelioration of symptoms, and the cessation of free discharge. Two of his patients who had complained of abdominal symptoms before the treatment was begun later came to operation for salpingo-oophoritis. Although the local condition of the lower genital tract had been fully controlled in two other cases there was probability of reinfection. Three patients disappeared from the dispensary after being under treatment for about a month. One patient developed symptoms of pelvic involvement soon after the treatment was begun, but her condition improved under rest in bed. The author concludes that the iodine treatment gives better results than any other which he has used.

The second paper was contributed by O. Hoffman,¹ who also reports excellent results. He uses a 3.5 per cent. solution of iodine in 95 per cent. alcohol, applying it first to the labia, and then injecting a few drops into the orifices of Bartholin's and Skene's glands by means of a long, blunt syringe, and finally making a copious application to the vagina, the cervix, and cervical canal. These applications are made every third day in all cases, both acute and chronic. The author makes the statement that only in exceptional cases did he find it necessary to treat the urethra.

In commenting upon this form of treatment in either male or female I would state that I have used various preparations of iodine in both sexes, and that I consider them all inferior to nitrate of silver. The old-fashioned injection of Dr. Gross has been found too irritating for general use, and at present is resorted to only rarely, when for any reason it is deemed inadvisable to use an injection of nitrate of silver. Its invariable effect has been to produce a profuse discharge accompanied by pain on micturition and soreness all along the anterior urethra. The most useful preparation that has been used is one consisting of 10 grains of iodine with enough potassium iodide and alcohol to liquefy it, added to 1 ounce of pure glycerine. This has apparently done good when applied to recent patches of infiltration in the anterior urethra, the so-called

¹ Interstate Medical Journal, August, 1913.

strictures of large caliber of the older writers. It has never been used in the posterior urethra, nitrate of silver or sulphate of copper being considered preferable. It has also apparently been of benefit in cases of chronic endocervicitis which have followed gonorrhreal infection, but in which neither microscopic examination of the secretion nor culture methods have demonstrated the presence of the gonococci. For any active lesions in this part of the female genital tract, a solution of iodine crystals in 95 per cent. carbolic acid, as recommended by Dr. Hartz, has given better results. I think that strong silver solutions (60 grains to the ounce) are on the whole superior. The iodine-carbolic acid is used, however, to swab out the cervical canal and uterine cavity after curettage. With the proprietary iodine compounds I have had very little experience and therefore cannot express an opinion. Iodine in petrogen has been used in some cases where an oily vehicle was thought to be advantageous. Its action is more prolonged than that of a glycerine compound.

Citrate of Copper in the Treatment of Gonorrhea. Schlasberg,¹ of Stockholm, treats gonorrhea in the female in the following manner: After the patient has emptied the bladder he injects 4 c.c. of a 2 per cent solution of soluble citrate of copper mixed with water and tragacanth in the proportion of eight grams of the former to 286 c.c. of the latter. An ointment syringe is used for this injection owing to the thick consistency of the preparation. The patient is instructed to hold the urine as long as possible. The same treatment is applied to the uterus. These injections are given once or twice a day. A number of prostitutes thus treated were kept under observation for a long time after the treatment had been stopped, and in a very large percentage of the cases all examinations for the gonococcus were negative, so that the author was forced to the conclusion that gonorrhea even in this class of women can be permanently cured by the treatment which he employed. The soluble citrate of copper is on the market under the name of *Eusylol*.

Urethral Chancre. An interesting case of this uncommon initial lesion has been reported by I. J. Walker,² of Boston. It was that of a man, aged twenty-six years, who first came under observation January 7, 1913, for a chronic gonorrhea. On February 10 he called attention to a small swelling on the side of the penis and complained of sharp pain upon urination. Examination revealed an oval induration on the floor of the urethra about one inch from the meatus. There was no enlargement of the inguinal lymph nodes. The patient stated that five days previously, upon the advice of a friend, he had used a urethral injection of sulphonaphthol, which caused him great pain and was followed by hemorrhage and urethral discharge. The swelling in the urethra was thought to be due to the injection and the patient was

¹ Dermat. Zeitschr., November, 1913.

² Boston Medical and Surgical Journal, January 8, 1914.

treated expectantly. Two months later he developed secondary syphilis and his blood gave a positive Wassermann reaction. In the absence of any external initial lesion the author concludes that it was situated in the urethra. This location of the initial lesion of syphilis is very rare. I have seen but two cases in ten years.

THE TESTICLES, EPIDIDYMIS, AND SEMINAL VESICLES.

Carcinoma of the Testicle. Hardouin¹ reports a case of cancer of the testicle operated upon eight years ago by simple castration in which the patient has continued perfectly well. The case was that of a man, aged forty-eight years, who was subjected to operation shortly after he first noticed swelling of the testicle.

Chevassu states that one-third of the patients operated upon by simple castration are cured, but Hardouin thinks that this proportion is too high. Certainly such an operation can be applicable only to beginning cases in which the malignant focus is confined strictly to the gland itself and in which no metastases have taken place.

An interesting case of intestinal obstruction due to cancer of a retained abdominal testicle has been reported by Tirumurti.² The patient entered the hospital for severe abdominal pain accompanied by vomiting and intestinal obstruction. Laparotomy revealed an enormous tumor which could not be removed. The patient died a few hours after the operation. At autopsy it was noticed that there was no testicle in the left side of the scrotum. The abdominal tumor was as large as an adult head, and completely filled the hypogastrium. Microscopic examination showed it to be a sarcoma. There was no trace of testicular tissue left, but it was assumed that the mass originally had been a retained abdominal testicle which underwent malignant degeneration.

I have seen one case of retained abdominal testicle which produced symptoms resembling those of acute appendicitis, the patient having been sent into the hospital with the diagnosis of the latter disease. When the abdomen was opened a large mass was felt in the right side of the pelvis. It was ligated and removed, and was shown to be a testicle that had become inflamed and into which hemorrhage had taken place. The appendix was normal.

Sarcoma of the Testicle. Petit de la Villéon³ reports a case of enormous sarcoma of the testicle, occurring in a child two years old, which is of interest in showing the relation of traumatism to the development of these neoplasms. The child had fallen twice and struck his perineum upon the metal rail of his bedstead. The first injury caused severe bruises of the scrotum. The second accident took place two weeks

¹ Bull. et mém. Soc. Anat., Paris, vol. xvi, No. 3.

² Annals of Surgery, March, 1914.

³ Jour. de Méd. de Bordeaux, November 30, 1913.

before the child was seen by the author. It also caused a severe bruise of the same side of the scrotum, and the testicle began to swell almost immediately after the injury. When the author first saw the little patient he presented an enormous tumor which extended downward almost to the level of the knees. The spermatic cords of both sides were apparently normal and the inguinal glands were not enlarged. An exploratory puncture was negative as to fluid. No signs of involvement of the abdomen or thoracic organs or of the spine could be detected, although the patient had lost a little flesh. A diagnosis of sarcoma of the right testicle was made, and an amputation of the tumor was performed, together with a high resection of the cord. The child stood the operation well, but the author thinks that the ultimate outcome of the case will be disastrous. The tumor weighed exactly 540 grams. Upon section, it was difficult to distinguish testicle from epididymis, both being involved in the neoplastic tissue.

Codman and Sheldon,¹ of Boston, have studied the results obtained in 80 cases of sarcoma of the testicle treated at the Massachusetts General Hospital during the last forty years. It was possible to determine the end-results in only 64 of these cases, and of the latter there were 39 patients who died from the disease, 12 who died from other diseases, and 13 who were living and well. The morbidity in the cases in which operation was done was 59.83 per cent. Of 33 patients who were operated upon and who later succumbed to the disease, there were 21 in whom no evidence of metastasis was found at the time of operation. All of these patients, however, died within three years.

Malignant Degeneration of Ectopic Testicle. Toder² considers the subject of malignant degeneration of testicles retained in the inguinal canal. As a rule, symptoms due to the change develop insidiously, although occasionally a sharp pain may be the first subjective sign which the patient experiences. More commonly a slight increase in the discomfort which the malposition of the organ has caused him is experienced. This may first be noticed after violent exercise or a long walk. Sometimes the gland may attain a considerable size before it causes any increased discomfort; thus in one case the author saw a patient in whom the tumor had become as large as a pigeon's egg within two months after it was first noticed, without causing the patient enough annoyance to make him quit work. In size, the tumor varies from a hazel-nut to the fetal head. In shape, it is generally oval, its longitudinal axis corresponding to the axis of the inguinal canal. It is movable, though hard, and sometimes presents distinct nodules. In one case which the author saw, fluctuation could be elicited at either end of the growth and also in its centre. Ulceration of the skin is very rare, the author having found in the literature only two cases in which it was reported. Examination should always be

¹ Boston Medical and Surgical Journal, February 19, 1914.

² American Journal of Urology, September, 1913.

made for enlarged lymph nodes, but because of their deep situation it is not always easy to feel them, even though some are found later at operation. As the tumor develops, the signs of malignant disease manifest themselves. The patient loses weight, becomes weak and cachectic, and succumbs to metastases. In view of the disposition of testes retained in the inguinal canal to undergo malignant change, the author suggests that operation should be practiced upon all children who are thus affected, an effort being made to restore the testicle to its normal position. In adults, in whom it is not improbable that the organ has lost its physiological function, he considers castration to be the operation of choice. Once malignant disease has begun, nothing but a radical operation will be of any use. The author reports two cases which he operated upon; one patient is well, nine years after operation, and the other eight years after. In the days when simple castration was done without invasion of the pelvis and removal of the lumbar and pre-aortic lymph nodes, cures were very rare. With our improved methods of operating, however, the prognosis seems to be better than ever before.

Bulkley¹ has studied 59 cases, including one that occurred in his own practice, in which retained testicles underwent malignant change. According to his statistics, it seems that about one out of seventy-five testes retained within the abdomen will undergo malignant metamorphosis. About one in every four abnormally situated testicles that undergo malignant change is found within the abdomen. The change takes place chiefly during the period of active sexual life. The greater number of malignant growths affecting them are teratomas. It is found that symptoms do not occur until the growth is large enough to produce pressure or until metastases have occurred. The prognosis is decidedly bad. Thus, of 59 cases studied, there were only 3 in which the patients were alive and well two years afterward.

Operative Treatment of Epididymitis. In previous reviews the operative treatment of epididymitis, both by incision and puncture, as well as by the injection of electrargol, has been discussed. During the past year a number of communications on the former method have come to my notice. One by Knight,² of the United States Marine Hospital Service, deals with five cases which were treated in the Hospital at Stapleton, Long Island, by means of a free incision through the tissues of the scrotum, delivery of the testicle, opening of the tunica vaginalis, and puncture of the epididymis with a blunt-pointed needle, which the author prefers to a probe or grooved director. Both the tunica vaginalis and the scrotal tissues were sutured. In two of the cases pus formation had taken place in the epididymis, but the results were just as satisfactory as in those in which simple infiltration had occurred. He always operates under local anesthesia.

¹ Surgery, Gynecology, and Obstetrics, December 13, 1913.

² Journal American Medical Association, January 31, 1914.

John H. Cunningham,¹ of Boston, has done the operation according to Hagner's method, with the exception of closing the wound, in 57 cases from which reliable deductions can be drawn. He makes a puncture at the bottom of the scrotum and introduces a rubber dam which is drawn along the epididymis. This is removed on the second day. In all but five of the cases, fluid was found in the tunica vaginalis, and in these five the parietal and visceral layers of the tunica were adherent. In 67 per cent. of the cases pus in varying amounts was found in the epididymis, and the microscopic examination revealed the presence of gonococci. In four cases the vas deferens was opened according to the method of Belfield. In six cases both sides were involved. In all of these, the author was able to make observations in regard to the presence of spermatozoa and in the semen of four they were found to be motile.

J. Bayard Clark,² of New York, also speaks highly of this little operation, stating that immediate relief from pain and decline in temperature invariably followed its performance.

My own experience with this operation coincides with that of the two authors here mentioned with regard to the prompt relief of pain and the shortening of the duration of the disease. It seems to me that the operation is truly an abortive procedure if employed sufficiently early. The results obtained in cases of three and four days' duration have not been nearly so satisfactory as in those in which operation was done during the first twenty-four hours after involvement of the epididymis. In the early cases it does not seem to me to be necessary to make an incision an inch and a half or two inches long, as some have recommended, but simply to incise the scrotum over that portion of the epididymis that is most swollen, usually the tail, and make multiple punctures by means of a hollow needle. This simple procedure, which I do under gas and oxygen anesthesia, has given exactly as good results as the more extensive operation.

Antimeningococcic Serum in the Treatment of Acute Gonorrhreal Epididymitis. Eugene Schmutz,³ of Paris, has found that injections of antimeningococcic serum have given him better results than any other treatment which he has used for acute epididymitis. In nearly all the cases in which he used it, the epididymis underwent complete *restitio ad integrum*. He considers the method extremely simple and uses it in all cases, even the most acute.

Bier's hyperemia he found to quiet pain, as did also the application of radio-active mud. The vaccine treatment seemed to shorten the course of the infection, but he considers it contra-indicated in the presence of high fever.

Purulent Hydrocele Due to Pneumococcus Infection. Local suppurations occurring during or after pneumonia are not very common, but cases

¹ *Surgery, Gynecology, and Obstetrics*, December, 1913.

² *Annals of Surgery*, May 18, 1914.

³ *Journal d'Urologie*, 1914, No. 2.

in which the specific microorganisms localize in certain organs of the body are reported from time to time. Some years ago I published a case of suppurative goitre which was due to this cause.

An interesting complication of pneumonia has recently been reported by Guillaune-Louis,¹ of Tours. It was that of a young man who developed purulent pneumococcic hydrocele as a complication of croupous pneumonia. The patient first noticed that his left testicle was a little tender, and after a few days found that the scrotum was very much inflamed. A week later the pain had become very acute, and the skin over the scrotum broke and allowed some pus to escape. The patient was transferred to the surgical service and was operated upon the same day. An incision of the scrotum allowed a large amount of grumous pus to escape, cultures from which showed the pneumococcus. This patient later developed a multiple arthritis from which, however, he made a good recovery.

Primary Carcinoma of the Epididymis. Malignant tumors of the epididymis are very rare. Takaguchi² reports the case of a young man, aged eighteen years, who consulted him because the left testicle had been enlarging constantly for fourteen weeks. Examination revealed the presence of a varicocele and a swelling of the left epididymis as large as a hazel-nut together with small nodules in the testicle. Unilateral castration was performed at once. Microscopic examination of the tissue removed at operation showed an atypical epithelioma of the epididymis with secondary invasion of the seminiferous tubules. Nine months later the patient developed a pulmonary infection. In the sputum cancer cells were found. There were, however, no tubercle bacilli. The patient died four months later. At autopsy metastases were found in the retroperitoneal and mediastinal lymph nodes and in both lungs.

Abscess of the Testicle. Primary suppurative orchitis occurring independently of septic infection or local foci is rare, and the literature contains very few references to it. The subject was thoroughly reviewed at the meeting of the American Association of Genito-urinary Surgeons at Washington in May, 1913, by J. D. Barney,³ of Boston, who reports two cases which occurred in his private practice and one which he treated at the Massachusetts General Hospital. The last one is the most interesting of the three and is worthy of reproduction here. It was that of a man, aged sixty-two years, whose family and previous personal history had no bearing upon the case, except insofar as herein stated. In boyhood he had had a swelling of the left side of the scrotum, which was not very painful or tender and which lasted only a few days, and had had another similar attack of two or three days' duration fifteen months previous to the time when he was admitted to the hospital. On October 18, 1912, he

¹ Arch. méd. chir. de Province, February, 1914.

² Frankfurter Zeitschr. f. Pathologie, 1914, No. 1.

³ Transactions American Association of Genito-urinary Surgeons, 1913.

caught a severe cold, which was complicated by increased frequency of micturition and considerable dysuria. After straining at the end of micturition, he would notice a discharge from the urethra. These symptoms subsided in about two weeks. As they passed away, however, the patient noticed a swelling in the left side of the scrotum which steadily increased and became painful to the touch. A loss of thirteen pounds in weight had taken place since the beginning of the trouble two months before. Examination revealed no abnormality of the prostate and seminal vesicles. The only condition worth noting was extensive pyorrhea alveolaris and some redness of the throat. Both the Wassermann reaction and the gonococcus fixation tests were negative; the urine was clear, contained no shreds, and failed to give a culture of any bacteria. The swelling in the scrotum extended up into the inguinal canal; was smooth, elastic, and fluctuant, and the spermatic cord was so much thickened that the vas could not be identified, nor could the epididymis be distinguished from the testicle. The fluctuant area of the tumor was incised, whereupon about four ounces of thick yellow, odorless pus flowed out. Digital examination of the wound showed that the pus came from the superficial tissues. The tunica vaginalis was then incised and two or three ounces more of pus flowed out. The testicle was found to contain an abscess cavity the size of an English walnut. The epididymis could be felt posteriorly. It was enlarged and indurated. The cord was ligated and divided near the external ring. Cultures from the pus showed the presence of the *Bacillus mucosus capsulatus* and the streptococcus. Convalescence was uneventful, and the patient left the hospital ten days after the operation. The author believes that the infection was hematogenous. The other cases reported occurred in men who had had gonorrhea with involvement of the epididymis. In one case, a growth of colon bacilli was obtained from cultures of the pus. In the other case no cultures were made. I have seen one case of suppurative orchitis which followed gonorrhreal epididymitis. There was sufficient destruction of the testicle to make castration necessary. Unfortunately no cultures were taken.

X-ray Studies of the Seminal Ducts. Belfield¹ has made interesting radiographic studies of the seminal vesicles which were injected through the vas deferens with different solutions. He states that collargol solution gives the best pictures. Inasmuch as occlusion of the vas deferens and the ejaculatory ducts is not uncommon, he makes a preliminary injection of argyrol solution in order to determine their patency. If this does not reach the prostatic urethra within twenty minutes, as shown by its appearance in the urine or through a catheter, the collargol solution is not injected. The capacity of the seminal vesicle and the vas deferens combined varies from 3 to 6 c.c. More than the latter quantity will overflow into the urethra if there be no obstruction. When it thus escapes

¹ Transactions American Urological Association, 1913.

any quantity desired can be injected, and the author thinks an ideal irrigation of the vas deferens, seminal vesicles, ejaculatory duct, and the prostatic urethra can be obtained in this manner. It has been found that argyrol solutions are usually entirely expelled within two days; collargol, however, may continue to appear in the urine for two weeks after the injection. Among the phenomena observed were tortuosity of the vas deferens, diverticula of its ampulla, and peristalsis of the vas and vesicle by means of which their contents were intermittently expelled into the prostatic urethra whence they usually flowed backward into the bladder. Intimate association of ureter and vesicle was also observed, which tends to show that infection of the vesicle causing adhesions to the ureter may produce stricture in the lower part of the latter and convert the vesicle into a pus tube. These experiments are very interesting, and it is probable that more will be learned about the diseases of the seminal vesicle as the work is carried further.

Intravesical Cyst of the Seminal Vesicle. Zinner¹ reports the case of a young man who had been troubled with pain at the end of micturition for a period of six months. The pain was intermittent, but had become progressively worse, and the desire to urinate more frequent. There was some difficulty in starting the stream. The patient had been perfectly well until the onset of this trouble. He had never had any sexual relations. The testicles and prostate were normal. The urine was clear, although it showed a slight trace of albumin. Microscopic examination of the sediment showed epithelium and a few red blood-corpuscles. Cystoscopic examination revealed a tumor which nearly filled the field of vision. On its surface, which appeared to be formed of a reddish-yellow mucous membrane, bloodvessels could be distinctly traced. The left ureteral orifice was normal; the right could not be seen. The tumor occupied the entire right side of the trigonum. Nothing could be learned by bimanual palpation. It was concluded that the tumor was cystic. The patient was subjected to operation and a cystic tumor as large as a child's fist was found. It burst when the mucosa was incised, and allowed the escape of a sanguinolent colloid fluid. In the bottom of the sac there was a greenish-yellow mass which resembled pus. The cyst was extirpated, and with it there came away a cord-like substance about 2 cm. long and as large as a match stick. In the bottom of the wound a small body about the size of a cherry presented, which was undoubtedly a seminal vesicle. In the cyst fluid numerous immobile spermatozoa were found, some of which showed degeneration. The masses which looked like pus were formed exclusively of spermatozoa, there being no leukocytes at all. The sequels of the operation were very good at first, but after a while pus began to issue from the vesical fistula and a large abscess opened into the rectum. The patient died on the twenty-third day after the operation. At autopsy a suppurative pelvic

¹ Wiener med. Woch., March, 1914.

peritonitis was found, together with necrosis of the vesical wall and a left-sided pyelonephritis. There was no kidney on the right side and only a terminal segment of ureter. The left seminal vesicle was normal; the right opened through its superior wall into the bladder to which it was intimately united. It was found that the left vas deferens had been denuded during the operation 2 cm. from its termination. Microscopic examination of the vesicle showed chronic inflammation, the superficial epithelium being only partly preserved, and the mucosa being replaced by a thick layer of granular fibrous tissue; it also showed hemorrhagic areas. There was an infiltration of leukocytes around the bloodvessels in the deeper strata. The case evidently was one of retention cyst of the seminal vesicle which developed as the result of a congenital absence of the ejaculatory canal.

Anastomosis of the Vas Deferens. In anastomosing the vas deferens, Wheeler¹ introduces a fine straight needle first into one segment and then into the other, and sutures the divided ends together over it. The needle is removed by pushing it out through the wall of the vas some distance from the line of suture. To strengthen the anastomosis, the line of suture is covered with the neighboring fascia.

Christian and Sanderson² insert a piece of No. 0 twenty-day chromi-sized catgut into each end of the vas and suture around it.

MISCELLANEOUS.

The Significance of Hiccough after Operations on the Genito-urinary Organs. Occasionally a patient who has been subjected to an operation upon some part of the urinary tract develops hiccough after the operation, and this in cases in which the peritoneum has not been touched, and in which there are no signs of peritonitis whatsoever. It lasts for a number of hours, then stops spontaneously, only to begin again after a while without any assignable cause. This may happen a number of times. It seems to bear no closer relation to the ingestion of food or activity on the part of the patient than it does to injury or involvement of the peritoneum. It is extremely fatiguing to the patients, interfering with sleep at night and disturbing their repose during the day.

This phenomenon has recently been studied by Marion,³ of Paris, who has analyzed several cases that came under his observation. He believes it to be due to intoxication by urea and thinks it is analogous to those toxic forms of hiccough which occur in pregnancy, in locomotor ataxia, and even in lead poisoning.

Some of these cases have been attributed to the action of the anesthetic, a theory which offers a plausible explanation. The author thinks that

¹ British Medical Journal, February 7, 1914.

² Journal American Medical Association, December 13, 1913.

³ Bull. et Mém. Soc. de Chir. de Paris, February 17, 1914.

the effect of the anesthetic upon the kidneys may produce a transient nephritis, particularly in those patients whose renal function is below par, and thus give rise to a temporary toxemia which causes the hiccup.

Marion's theory is interesting and may explain the occurrence of this disagreeable postoperative sequel. That all cases depend upon it, however, is to be doubted.

Infection of the Genito-urinary Organs with the Bacillus of Influenza. Raskay¹ reports three cases in which the bacillus of influenza was considered responsible for a urogenital infection. The first case was that of a patient, aged twenty-seven years, who had had an attack of the pulmonary form of influenza. Twelve days after his temperature had become normal, he was seized with a sudden attack of muscular pain associated with high fever, which was shortly followed by the appearance of a purpuric rash and the development of hematuria. The urine contained albumin, pus cells, and epithelium in addition to the blood. Bacteriological examination revealed the presence of the influenza bacillus. Five days later cystoscopic examination showed the bladder to be congested and to be studded with punctiform hemorrhagic spots.

The second case was that of a woman, aged forty-four years, who had had an attack of bronchial influenza which lasted about eight or ten days. She was ill for ten days, having run a continuous fever, which was associated with pain in the loins. Her temperature then became irregular, and she developed a considerable degree of strangury. This continued for four months and became progressively, though slowly, worse. Her urine became very cloudy. Physical examination showed that the left kidney was somewhat enlarged and that it was sensitive to pressure. Catheterization of the ureters brought away a purulent urine from the left kidney in which the bacillus of influenza was found. The bacillus was grown by culture methods. Pus obtained from the kidney, which was exposed and cut into, likewise gave cultures of the bacilli of influenza.

The third case was that of a man, aged twenty-three years, who had had an attack of influenza-pneumonia in 1889, and who was seized with a sudden chill and strangury five days after his temperature had become normal. His urine at that time contained pus. Thirteen years later he developed a prostatic abscess, the contents of which were negative to the gonococcus. He recovered from the abscess without operation. From time to time, however, exacerbations of the chronic inflammation, remaining after the abscess had broken, would occur. He also developed a left-sided epididymitis, which went on to suppuration and resulted in the formation of fistulæ. The testicle and epididymis were removed. A year and a half later the same conditions developed on the right side. Although in this case the bacilli of influenza could not be demonstrated, it was believed that they were responsible for the suppuration

¹ Virchow's Archives, 1913, Band 213.

in the prostate and epididymis, as neither the gonococcus nor the tubercle bacillus could be found.

Urinary Antiseptics. Jordan¹ has studied the action of different urinary antiseptics, including hexamethylentetramin and its derivatives, oil of sandalwood, salicylic, benzoic and boric acids, *uva ursi*, and arbutin. The colon bacillus and the staphylococcus *pyogenes aureus* were the bacteria selected upon which to try the action of the drugs. It was found that a high degree of acidity inhibited the growth of the staphylococcus; but, in order to prevent any growth whatsoever, it was necessary to obtain a degree seven or eight times greater than that which could be obtained by giving acids by mouth. The colon bacillus was not affected by the reaction of the urine. The experiments confirmed the already well-established fact that urotropin is effective only when the urine is acid. Oil of sandalwood was found to act only slightly upon the colon bacillus but very energetically upon the staphylococcus. This, possibly, explains why the drug is effective in relieving cases of urethritis where the staphylococcus has largely superseded the gonococcus. Salicylic and benzoic acids likewise proved inhibitory to the growth of the staphylococcus, especially when the urine was highly acid. Very favorable results were obtained from boric acid in cases in which the urine was alkaline. *Uva ursi* acted strongly upon the growth of the colon bacillus, less favorable action being obtained from arbutin. The author concludes that boric acid and *uva ursi* are the best drugs that can be given in cases of ammoniacal decomposition of the urine, and that oil of sandalwood is the most valuable in staphylococcal infections.

A New Culture Medium for the Gonococcus. Hirschfelder,² of San Francisco, recommends a new culture medium for the gonococcus. 200 grams of bullock's testicle ground with a sausage grinder are boiled with 1000 c.c. of water alkalized with sodium hydroxide to the extent that 10 c.c. required 1 c.c. of decinormal acid to neutralize it to phenolphthalein. This mixture is filtered and one part of it is then added to three parts of agar prepared as follows: veal bouillon, 1000 c.c.; saturated solution of sodium phosphate made neutral to phenolphthalein with phosphate acid, 100 c.c.; agar, 30 grams.

Alypin Poisoning. A number of cases of poisoning by alypin have recently been published. Lichtenstein³ reports one in which sudden death occurred, as does also W. Israel.⁴ The former states that he had a case in which a 1 per cent. solution was used to block the sciatic nerve, with the result that the patient became cyanosed, was seized with spasms, stopped breathing for more than a minute. He remained unconscious for an hour. Lichtenstein mentions similar cases that have occurred in the prac-

¹ British Medical Journal, September 13, 1913.

² Journal American Medical Association, March 7, 1914.

³ Therapie der Gegenwart, February, 1914.

⁴ Zeitschr. f. Urologie, Zweites Beiheft, 1914.

tice of Schöeder and Garrasch. Israel's case occurred after the injection of a solution into the bladder, and as this drug has been used extensively in genito-urinary practice of late, the warning of its dangers that Israel gives is not untimely. The general belief seems to be that the drug is not at all dangerous. I have used it in a number of cases, in both urethra and bladder, and have never had any untoward effects, but it is evident that more caution must be used in its employment than has heretofore been considered necessary.

SURGERY OF THE EXTREMITIES, SHOCK, ANESTHESIA, INFECTIONS, FRACTURES AND DISLOCATIONS, AND TUMORS.

BY JOSEPH C. BLOODGOOD, M.D.

SHOCK.

General. The contribution of Frank C. Mann¹ on the "Peripheral Origin of Surgical Shock" deserves special notice, because it disagrees with many of the previous conclusions which were considered pretty well established. The experimental work was done in the Laboratory of Experimental Surgery of Indiana University, under the direction of Dr. Gatch, the head of this clinic.

The following are some of the remarkable conclusions:

"1. It is impossible to reduce the anesthetized animal to a state of shock by any degree of sensory stimulation, provided all hemorrhage is prevented and its abdomen is not opened."

In my experience with operative surgery under general anesthesia, in which the condition of the patient has been most carefully recorded and the blood-pressure changes estimated during the entire operation, I have observed extreme degrees of shock in operations other than on the abdomen, even though there had been no hemorrhage. For example, during operations for old, badly united fractures of the shaft of the femur. In these cases the only factors which could have produced shock were the painful stripping of the periosteum and the extreme extension of the limb.

"2. We have been unable to show that acapnia is a primary factor in the production of shock."

This conclusion, therefore, disputes the claims of Henderson. In my own clinical work, I have as yet been unable to estimate acapnia as a factor in shock.

"3. Shock is not due to a disturbance of respiration, but the respiratory centre is more quickly injured than any other vital centre by shock."

I am unable to critically discuss this, the third, conclusion, because I do not understand the statement.

"4. The vasomotor centre is not depressed nor fatigued. It is the most resistant of all vital centres. The peripheral and untraumatized visceral arteries are constricted in shock."

¹ Johns Hopkins Hospital Bulletin, 1914, xxiv, 205.

This must be a very difficult thing to prove or disprove. Crile has always favored the theory of fatigue or exhaustion; Meltzer, inhibition; while Howell, from his experiments, is of the opinion that there is more than one factor influencing this centre. Apparently, from the standpoint of pure physiology, the exact relationship of the vasomotor centre to shock seems still to be theoretical.

"5. Shock is not due to the primary failure of the heart, nor to the involvement of the cardio-inhibitory or cardio-accelerator mechanism."

This seems to be the view of most experimenters and the majority of clinicians who have been careful observers of the physiology of shock during operation. Yet Howell recognized a cardiac shock.

"6. It is impossible to produce the signs of shock by the use of excessive heat or cold."

If this is true in these experiments, it cannot disprove the immense clinical evidence of the effect of excessive heat or cold on the general condition of injured individuals or patients during operation.

"7. The easiest and most certain method of producing shock is by the exposure and traumatism of abdominal viscera. This, judging from the literature, has been the method used by nearly all investigators on shock."

Here we have an admission that shock can be produced by exposure and trauma to the abdominal viscera, while in the first conclusion it was denied to be due to any sensory disturbance outside of the abdomen provided there was no hemorrhage. Therefore, these experiments seem to show that it is sensory disturbance, but only of abdominal viscera, that will produce shock. Clinical observations, as I have said before, do not agree with this, and it discredits, or fails to confirm, the extensive experimental work of Crile and others.

"8. Shock produced by exposure of the abdominal viscera is not due alone to a paralysis of the vasomotor mechanism of the splanchnic area. This has been shown by two crucial experiments: (1) Section of the cord or splanchnic nerve does not produce shock. (2) When all the abdominal and thoracic organs are taken from the animal (Carrel) this 'visceral organism' can still be kept alive for many hours, and it can digest food and excrete urine, etc. Therefore, some other cause than vasomotor paralysis or inhibition is involved."

I must confess I fail to see the truth in this statement.

"9. The cause of shock is the tremendous loss of red cells and fluid from the blood due to the reaction of the great, delicate, vascular, splanchnic area to irritation—acute inflammation of the peritoneum due to trauma and exposure to the air and changes of temperature. The great amount of this loss is apparent when it is taken into consideration that the peritoneum has an extent as great as the entire cutaneous surface of the body. The factors involved in this reaction to irritation are the same as those involved in any other local inflammatory process, and

certainly do not involve the nervous system to any great extent. The profound general effect is due to the actual loss of red cells and fluid from the circulating blood through stasis, diapedesis, exudate, endothelial changes. It is to be noted that some of the classical descriptions of inflammation were made from observations on the exposed omentum and mesentery. In the course of operations in which the abdomen has not been opened, a loss of fluid and cells from the blood occurred, but the loss is, except when great areas of subcutaneous tissue have been exposed, comparatively unimportant."

Now, this statement simply brings into prominence another factor in the cause of shock—a factor observed chiefly in operations within the abdomen. But I do not see how it can disprove the factor due to sensory impulses carried to the nervous system. This additional factor may explain the more common occurrence and the greater degree of shock in injuries of, and operations upon, the abdominal viscera. Surely, no one can disprove that irritation of the parietal peritoneum and traction on the mesentery produce sensory disturbances which are received by the central nervous system.

In my experience with abdominal surgery, I am quite certain that the shock is less when one avoids these painful manipulations, yet the operation may last longer, so that there would be a greater opportunity for the action of this other factor.

I am confident that if the surgeon disregards the sensibility of abdominal viscera and peritoneum, he will observe shock more frequently.

"10. Certain accessory factors which help to produce the condition of shock should be mentioned. These are: muscular relaxation, decrease in intra-abdominal pressure, and impaired respiration—all of which tend to decrease the amount of blood returned to the heart. The effect of chilling and the use of hot applications should be considered."

The last statement seems a little out of place when we look back at conclusion 6. If this experimenter had really proved that muscular relaxation is an accessory factor in shock, this evidence can be used with other evidence against deep general narcosis.

"11. Degenerative changes in the cells of the central nervous system are the result, and not the cause, of shock. Dolley states that identical changes in the nerve cells are produced by hemorrhage and shock."

This conclusion is unnecessary, because, as far as I have read, Crile and Dolley have never claimed that these changes in the nerve cells were the cause of shock.

"12. General anesthesia of moderate depth prevents painful impulses from affecting the nerve cells of the central nervous system. Nerve-blocking under such conditions is useless, so far as the prevention of shock is concerned."

In this conclusion, Mann therefore admits that there is such a factor in shock as painful impulses through afferent nerves to the central ner-

vous system. Yet, in his first conclusion he states that it is impossible to produce shock if all hemorrhage is prevented and the abdomen is not opened.

In this conclusion (12) we have portrayed the most debated ground in the problem of shock. Mann absolutely disagrees with Crile's association and with the importance of combining local with general anesthesia. My own clinical observations up to date force me to agree with Crile.

In this paper the details of Mann's experiments are not given, so that it is impossible to study critically the methods of investigation. One, however, is always interested in a paper, especially on experimental work, which disproves previous conclusions. This is especially so in shock, because the problems are by no means settled, and much is theoretical. As stated before, my own clinical observations do not agree with these conclusions, and I have investigated the subject most carefully.

Nevertheless, it is interesting, instructive, and stimulating to get a new point of view, and we should look forward to a more elaborate contribution by Mann on this subject.

The thirty-four references to the literature represent the best of the many contributions to this subject. Practically all of them have been previously discussed in my contributions to PROGRESSIVE MEDICINE.

Major G. Seelig¹ gives a most comprehensive and interesting critical abstract on the nature of shock, with this conclusion, "And thus the problem stands—still unsolved."

In reading this review I find that Seelig has come to about the same conclusion as that expressed in PROGRESSIVE MEDICINE since I began to write on shock in 1899, and the conclusion is this, that, although from a theoretical stand-point many of the problems in shock are still unsolved, nevertheless the experimental work of pure physiologists and of surgical physiologists, and the critical observations of surgeons before, during, and after operation, have led to a better conception of the condition we call shock, and this has led to a method of treatment which, in the majority of cases, has prevented, or lessened, shock, and, when shock could not be prevented, to a treatment which has reduced its mortality.

A. Rendle Short² gives another critical review of the nature of surgical shock. He emphasizes the four chief theories: (1) The Crile-Mummery theory, that the vasoconstrictor centre is exhausted; (2) the Yandell Henderson theory, that shock is due to acapnia; (3) the Boise theory, that shock is due to primary cardiac spasm; (4) the Meltzer theory of inhibition. He objects to all of these theories. In regard to the first, he states that in shock the arteries are contracted and the vasoconstrictor centre

¹ *Surgery, Gynecology, and Obstetrics*, 1914, xviii, Abstr., p. 117.

² *British Journal of Surgery*, 1914, i, 114.

is not exhausted; in regard to the second, that acapnia is not present; in regard to the third, that the heart muscle still responds after saline transfusion; as to Meltzer's theory, he writes, "It is an abandonment of the problem."

Three further phenomena or factors are mentioned—oligemia, degenerative changes in the nerve cells, and the loss of chromaffine substance in the suprarenal.

It is this author's opinion that the chief cause of shock is oligemia induced by loss of fluid, partly into the injured area and partly through the capillaries all over the body in consequence of reflex vasoconstriction, due to the stimulation of the pressor afferent nerves. Sudden collapse may then be precipitated by stimulation of the depressor afferents. The author gives some of his experiments, and there follow references to the most important literature.

Yandell Henderson,¹ in his paper before the International Congress of Medicine in London, in August, 1913, discusses the subject under the following title: "A Comparison of the Immediate and After-effects of Spinal and Local Analgesia with Those of Inhalation Anesthesia, in Respect to Shock and Psychic Shock." When the operation is performed under local or spinal anesthesia, traumatic shock due to physical pain may be prevented, but the patient may have fear and anxiety with the result of psychic shock. This can be eliminated by general anesthesia. Therefore, Henderson agrees with Crile in this practical point. Henderson is also of the opinion that, in general anesthesia, afferent pain influences are less.

During anesthesia, he emphasizes the supreme importance of quiet breathing and is of the opinion that the local analgesia, blocking, as it does, afferent sensations, helps in maintaining quiet respiration during general anesthesia.

In unskilled administration of anesthetics, particularly ether, there is danger of excessive, or forced, respiration, with the resulting acapnia which is often followed by respiratory failure.

One would judge that Henderson placed great significance upon quiet respiration. My clinical experience agrees with this. He also repeats his statements in regard to the advantage of rebreathing methods in nitrous-oxide-oxygen anesthesia. He writes that the oxygen employed should contain from 5 to 8 per cent. of carbon dioxide, as this will act as a stimulant to respiration.

Henry H. Janeway and Ephraim M. Ewing² present the result of their experimental investigation in regard to the nature of shock. This paper was read before the Section on Pathology and Physiology of the American Medical Association in Minneapolis, June, 1913. Their conclusions are somewhat as follows:

¹ Abstract in *Surgery, Gynecology, and Obstetrics*, 1914, xviii, p. 3.

² *Annals of Surgery*, 1914, lix, 158.

The all-important factor in the development of shock is the loss of vasomotor control, and if this reaches a certain degree there is failure to recover.

The loss of control of the vasomotor centre and its maintenance is never caused by acapnia or exhaustion of the central nervous system, but is due to local peripheral causes, such as mechanical obstruction, loss of blood, and trauma to viscera. This is chiefly seen in operations within the abdomen. They do not agree with Crile's anoxic-association. Their experiments show that general anesthesia with nitrous oxide and oxygen is far better than with ether.

This discussion shows that Seelig's statement that the problem is still unsolved is true.

We all may differ as to physiological explanations of what we call shock, but, in clinical work, the majority agree that at the present time the best indication of threatening shock is a fall in the blood-pressure. Those surgeons who have in mind the experimental work seem better able to appreciate the factors of shock in their operative work. The methods of prevention are well understood, and I am quite certain that these surgeons have a smaller mortality, fewer postoperative complications, and a more comfortable and shorter convalescence. All of these questions have been carefully considered in previous numbers of PROGRESSIVE MEDICINE.

TREATMENT. In recent literature I find nothing new on the employment of salt solution, adrenalin, strophanthin, or heart massage in the treatment of shock or collapse. Apparently adrenalin has been given up. My experience with strophanthin intravenously has enlarged, and my impressions are still very favorable to its usefulness. I only employ it when the blood-pressure is low and falling, and when it does not rise after a change in position of the patient (head low) and salt solution given subcutaneously and by enema. I give the strophanthin, however, before trying intravenous salt.

In Lane's Clinic, in London, I noticed that during his operation for resection of the colon, subcutaneous salt infusion was started at the beginning of the operation and was continued throughout. I heard Lane make the remark that he never observed shock. It impressed me as a rather careless statement that many surgeons are apt to make in the excitement of a public clinic. It belongs to the same class of remarks as those often made by surgeons that their wounds never supplicated, and that they had never any trouble with catgut.

I have just found the following reference which was misplaced on account of its confusing title: Disturbances of Circulation. Heidenhain¹ clinically has confirmed the experimental results of the combined action of adrenalin and pituitrin on the peripheral vessels, increasing blood-pressure and tiding patients over shock. He employs the fol-

¹ Deutsche Zeitschr. f. Chir., 1914, cxxviii, 202.

lowing for intravenous infusion: 8 to 10 drops of adrenalin and 1 c.c. of pituitrin to 1 liter of salt solution. He also reports most satisfactory results with strophanthin given either intramuscularly or intravenously. In addition, he gives a very interesting account of cynamin as a substitute for digitalin. It is to be employed in the postoperative course when, in addition to a weak circulation, there is anuria or edema.

PREOPERATIVE INVESTIGATION AND TREATMENT. In the more recent previous numbers of *PROGRESSIVE MEDICINE* I have rather elaborately discussed the various contributions to the investigation of the patient before operation and the various methods of preparing him for the operation. It is now well known that shock does not necessarily begin with the anesthesia and operative manipulations. The disease itself from its onset may affect the general condition of the patient, lower the vitality and reduce the so-called factors of safety. Operative treatment, therefore, instituted as early as possible after the onset of the surgical disease, has many advantages beyond increasing the probability of a permanent cure. The patient comes to the operative ordeal in a better condition. In many acute surgical conditions, the delay of a few hours increases the mortality.

F. J. Plondke¹ makes a plea for more thorough preparatory and post-operative treatment. He claims that the surgeon of large operative experience is often too busy to give much attention to these details and trusts the pre- and postoperative course to surgeons of less experience. Plondke first emphasizes the importance of a painstaking investigation with all the methods and instruments of precision to estimate the general condition of the patient and the function of the various organs. In general, he recommends a restricted diet from two to three days before operation and a cathartic twenty-four to thirty-six hours before operation. He also favors the routine administration of salt solution subcutaneously before the operation begins, and salt *per rectum* by the Murphy method after operation. He does not recommend any hypodermic stimulation, but advises the use of morphin hypodermically for pain or other postoperative discomfort. The employment of gastric lavage, if vomiting persists, is advocated; for postoperative gas distention, change in position of the patient and frequent rectal enemas. When the distention is marked and not relieved by these simpler methods, Plondke has had good results with hormonal, 20 c.c. intravenously.

I am inclined to think that the majority of surgeons will agree with this summary. My experience teaches me that uniformly good results are best obtained by not waiting for symptoms.

Every patient should be treated as if very ill, that is, the treatment should be preventive; for example, do not wait for the typical signs of

¹ Lancet, 1913, xxxiii, 685; *Surgery, Gynecology, and Obstetrics*, 1914, xviii, Abstr., 344.

acute dilatation of the stomach, or extreme distention, or anuria, to begin treatment. The details with regard to this have already been discussed in previous numbers of PROGRESSIVE MEDICINE (December, 1912). I will, however, repeat four references here which I would advise my readers to go over in the original: G. Paul Laroque,¹ Joseph C. Bloodgood,² John M. T. Finney,³ Maurice H. Richardson,⁴ and Joseph C. Bloodgood.⁵

The following conditions have been well discussed in previous numbers of PROGRESSIVE MEDICINE, but I find nothing of importance in recent literature.

KIDNEY FUNCTION. In my own experience, I look upon the estimation of the kidney function as such a valuable adjunct that I think a test should be made in most cases, and, when the kidney function is low, we can in a few days prepare the patient for the operation. In a few cases, when the function does not improve, an operation of any magnitude is contra-indicated, for example, in obstruction from hypertrophy of the prostate. One would here choose the minor operation of suprapubic drainage for temporary relief, rather than any form of prostatectomy for permanent relief.

THE BLOOD. A blood-count will always give the surgeon an accurate picture of the presence or absence of anemia. Fortunately, in extreme anemias we now have a method of treatment—blood-transfusion—which will allow an operation of considerable magnitude, if such an operation is indicated.

BLOOD-PRESSURE. There is no difficulty whatever in getting repeated blood-pressure estimations before and after operation, and we know pretty well how to act within certain limits in the presence of low and high blood-pressure. I may discuss this more fully later.

DIABETES. The literature on this subject is large and has been discussed here. A surgeon familiar with this will know how to act when sugar is present in the urine of the patient to be operated on.

Other conditions will be discussed later under different headings.

HEART LESIONS AND ESTIMATION OF CARDIAC FUNCTION. Edward Reynolds,⁶ in a symposium before the American Gynecological Society in May, 1913, discussed "The Conduct of Gynecological Operations in the Presence of Chronic Affections of the Heart." He first quotes Maurice H. Richardson with this statement: "Modern surgery disturbs the vital processes extremely little." Then Reynolds goes on to say that the risk of an operation in the presence of chronic affections of the heart are relatively small. He advises consultation with an expert

¹ Old Dominion Journal, May, 1912, xiv, 285.

² Journal American Medical Association, 1912, lviii, 829.

³ Ibid., 1912, lviii, 1475.

⁴ Ibid., 1912, lviii, 1473.

⁵ Annals of Surgery, 1912, lv, 641.

⁶ Surgery, Gynecology, and Obstetrics, 1913, xvii, 297.

internist and anesthetist, so that the patient can be given the benefit of the best preoperative treatment, the most expert anesthesia by one familiar with the handicapped patient. The surgeon should also call upon the internist for help in the postoperative treatment, because the dangers of heart complications are not passed when the operation is over.

John O. Pollack¹ makes some very valuable suggestions in his paper on the same subject, which was read at the same symposium. During the preoperative examination of the patient we should be influenced more by symptoms, that is, cardiac compensation, rather than lesions as revealed by sounds and percussion. In the preoperative treatment, rest is the most important. The rest must not only be physical, but mental. Morphin will be helpful for discomfort, and strophanthus and digitalis useful under certain conditions. He quotes cases operated on by him with success when the hemoglobin was low and the blood-pressure but 80. I get the impression, however, that these were operations of necessity, the patient's blood and blood-pressure conditions were dependent upon the surgical lesion, and that the operation relieved them of such a burden that the operative shock was lost in the balance of accounts.

Pollack, in dealing with acute and chronic cardiac lesions, gives the advice as to methods of preoperative, operative, and postoperative treatment that should be employed in all cases, whether there be a heart lesion or not. The only special point of importance is the position of the patient. In pelvic lesions, the Trendelenburg position is often necessary to facilitate the operative measures, and this position is often bad for certain cardiac cases. So that, if it is employed at all, this position should be maintained over as short a period as possible.

It is very interesting, especially for me, to read articles of this kind and to find that surgeons are learning that for handicapped patients certain measures must be employed to reduce the operative mortality. For a number of years I have been advocating that these measures should be employed as a routine in all cases. They do no harm to the unhandicapped patient, although they may not always be absolutely necessary. It is often difficult to ascertain, from the most careful examination, whether a handicap is present or not. This is especially true with regard to the heart. We are never certain of the presence or absence of myocarditis, nor have we any positive methods of finding out the exact factors of safety in each individual case. To employ these measures of safety in all cases develops the technique, so that when one really meets a patient with a serious handicap the team-work in the operating room is much better for the emergency, because then the operation is one of emergency, or an unusual one, but not the method. Pollack also prefers local anesthesia in addition to general.

¹ *Surgery, Gynecology, and Obstetrics*, 1913, xvii, p. 300.

J. Clarence Webster¹ discusses the conduct of pregnancy and labor in acute and chronic affections of the heart. He is of the opinion that surgical procedure should be avoided, if possible. He is not adverse to ether, but when there is pulmonary edema or bronchitis, he prefers nitrous oxide and oxygen. If possible, local anesthesia. All of these writers advise the employment of morphin. Webster objects to the Trendelenburg position in bad heart cases.

FUNCTIONAL TEST OF THE HEART. Willy Hofmann,² from Katzenstein's Clinic in Berlin, gives a very interesting résumé of the various methods for testing cardiac function, and concludes that, among the modern methods, the most efficient test is that of Katzenstein. In this method, blood-pressure readings are recorded with the Gärtner tonometer before, during, and after digital compression of the femoral arteries, and compared with pulse readings at the same time. As it would be very difficult to give in brief an exact picture of this method, I refer to the original. I have as yet had no experience with it, but it seems to be a step in progress. The method apparently is not much more difficult, although it takes a little more time, than the ordinary blood-pressure record, which many of us are now making on our surgical patients before, during, and after operation.

OPERATIVE SHOCK. Crile and Lower, in their new book entitled *Anoci-association*,³ bring the results of their experimental, theoretical, and clinical investigations up to date. As we have shown in the beginning of this discussion, there is great difference of opinion in regard to the real factors in shock, but no surgeon would take the position that there is no such thing as shock from operation, and that this condition, whatever its factor, is responsible for much of the mortality after operation and for the complications and discomforts, and for the disability following operations. We, therefore, must do all within our power to attempt to find out what methods in preoperative treatment, during the operation, and after the operation, will reduce or eliminate this mortality, these complications, and the longer period of convalescence. Crile, in his method of anoci-association, attempts to reduce the psychic, traumatic, and toxic factors of shock. Everyone agrees as to the hemorrhagic factor and the importance of making operations as bloodless as possible. But, when we come to the traumatic factor, a large number of surgeons do not agree with Crile as to the importance of blocking sensory impulses by local infiltration in the region of the wound. Some of these will agree to the performance of some operation under local anesthesia alone, but when general anesthesia is employed, to this group of surgeons local anesthesia is an unnecessary and time-consuming adjunct. There is yet a great difference of opinion in regard to general anesthesia. Many experienced surgeons have not adopted nitrous oxide and oxy-

¹ Surgery, Gynecology, and Obstetrics, 1913, xvii, 294.

² Archiv f. klin. Chir., 1914, civ, 107.

³ Philadelphia, July, 1914.

gen and still prefer ether. The history of anesthesia portrays the same controversy in regard to ether as to chloroform. It was many years before ether became the anesthetic of choice, and now the same dispute is going on between the advocates of nitrous oxide with oxygen and of ether.

Many surgeons pay little attention to the psychic factor of shock.

My own personal experience agrees largely with Crile's and, if one really carefully investigates mortality, postoperative complications and the period of disability, one sees more clearly the truth of Crile's statements.

Crile's first monograph appeared in 1897. My first discussion of this subject appeared in PROGRESSIVE MEDICINE in December, 1899. It required a number of years to influence surgeons to give up strychnine and other forms of hypodermic stimulation and to employ salt solution, and so we could discuss each of the various methods of treatment.

When the difference in the primary mortality, the postoperative complications, and the period of disability between the surgeons who appreciate the factors of shock and adopt appropriate treatment and those who do not is thoroughly understood by the public, these methods will have a much wider employment. If I read the signs of the times correctly, the battle is certainly being won by those who agree with Crile at least as to the practical application, although they may not go as far as he does in the theoretical. But, as far as I am able to judge, his theoretical speculations have never done any harm.

POSTOPERATIVE COMPLICATIONS.

Cerebral Hemorrhage. Some six months ago I observed for the first time, after an apparently uncomplicated operation upon a patient with no demonstrable handicap, a complete left-sided hemiplegia. It took place six hours after operation. The patient was a woman, aged forty years, and the operation was the usual complete dissection for cancer of the left breast. The examination before operation disclosed no other lesion. A number of blood-pressure examinations exhibited normal tension. The operation under nitrous oxide and oxygen was without any mishaps, and the patient remained quiet throughout the operation. The record of the pulse and blood-pressure during the operation showed no fluctuations—the average pulse was 80 and the blood-pressure 120. After the wound was closed, and a few minutes after the gas had been discontinued, the patient became pale, the respirations labored, the pulse accelerated, and the blood-pressure fell rapidly to 80—the usual picture of syncope—but the patient had not fully returned to consciousness when it took place. Therefore, it could not have been psychic. We opened the wound and found that there had been no hemorrhage. As every vein had been ligated most carefully

with silk, I did not see how an air or fat embolism could have taken place. The reaction to normal progressed slowly under change of position (head low) and a subcutaneous salt infusion. No intravenous medication was employed. The patient was kept in the operating-room for about two hours, and then, when taken to her room, had no symptoms of the syncope. Four hours later, while she was telling her nurse that she was glad the operation was over, the nurse observed thickness of speech and change in the facial expression. When I saw the patient a few minutes later there was complete paralysis of the left face, tongue, arm, and leg. The blood-pressure had fallen from 110 to 100. An ophthalmic examination made a few days later showed slight changes in retinal vessels, but there were no other evidences of arteriosclerosis. The patient made a slow but almost complete recovery. Of course, it is possible to have an arteriosclerosis of the cerebral artery without high blood-pressure.

I have been over the literature as carefully as possible, and find that this is a very unusual complication. I mention this here, so that if it should occur to one of my readers, they will be able to assure the family that it is by no means always fatal and that almost complete recovery may take place. In the fatal cases, death takes place within a few hours. In some cases, the recovery is very rapid—in a few days to a few weeks. In others, as in this, it may be slow—a few months. The clinical picture and course, therefore, are not different from the ordinary case of hemiplegia due to embolism, hemorrhage or thrombosis.

Pneumonia. If I can judge from my own experience, and the absence of much in the literature since 1909, postoperative pneumonia must be becoming a less frequent complication, and this is evidence of better anesthesia and better methods of operation.

Postoperative Distention. I find nothing new since my discussion last year on *hormonal for the treatment of gas distention*. I have not used it in my own clinic. In fact, extreme cases of this complication I do not often see now. For the past three years in my clinic, I have employed the following *method after operation*: The rectal salt by the drop method, begun as soon as the patient reaches the bed, is continued for about four hours; then, in two hours, an enema of oil and glycerin is given; this is continued for one, two, three, or more days until the patient expels gas without this assistance. In all stomach cases, and in all severe abdominal cases, the stomach is washed out within twelve hours after operation, and one ounce of castor oil left. If any residuum is found, the stomach washings are continued until the absence of residuum demonstrates that they are no longer necessary. No other cathartic but this castor oil is employed. We, therefore, do not wait for extreme gas distention or symptoms of dilatation of the stomach. It seems to me that the efficacy of this treatment is illustrated by the fact that I have no difficulty in getting my residents to do this. They seem

so confident that it is best for the patient, and that, in addition, it really saves them (the residents) anxiety and trouble, that they follow this routine treatment without insistence on my part. If one explains to the patients why this is done, they rarely object, even to the stomach lavage. The majority of people are now pretty well educated to preventive measures.

Anuria. Arthur Evans¹ reports a most remarkable case. The patient was a girl, aged eleven; the operation was done for an acute appendix distended with pus; peritonitis was but slight and local; usual operation with drainage. On the fourth day the patient began to complain of pain in the loin, and there was diminution in the amount of urine passed. Within thirty-six hours there was complete anuria with all the general symptoms of uremia. The surgeon then rapidly exposed one, and then the other, kidney, splitting each kidney and packing the pelvis with gauze. The symptoms of uremia rapidly disappeared, the drainage became saturated with urine. At the end of the third day urine was passed naturally. After the removal of the gauze drain the wound healed rapidly, and the patient made a complete recovery. This was a very unusual case and the operative means employed seem rather desperate. Of course, it is quite possible that this patient had a post-scarlatinal nephritis, but there is nothing mentioned about this in the history.

ANESTHESIA.

The literature on anesthesia makes good reading. It demonstrates that surgeons are of the opinion that anesthesia is one of the most important factors influencing the result of operation. The special anesthetist has apparently come to stay, and we are now seeing excellent articles by these well-trained men who are devoting their entire time to anesthesia. Local anesthesia must always be in the hands and under the control of the operating surgeon, but the general anesthetic must be delegated to someone else, and there seems no doubt that the one who gives the general anesthesia should, if possible, be as well trained in these various methods as the surgeon in the technique of the operation.

At the meeting of the American Medical Association in June, 1912, there was a report of the Committee on Anesthesia by Yandell Henderson and a symposium on the same subject before the Section on Physiology and Pathology. At that time there was formed the American Association of Anesthetists. Their first annual meeting took place in Minneapolis, June, 1913, and the papers² read at this meeting have been published.

¹ British Journal of Children's Diseases, 1914, xvi, 167.

² Annals of Surgery, 1913, lviii, 65.

Gwathmey, in the presidential address, gives an excellent résumé of the different methods of anesthesia, and discusses the subject from the stand-point of the special anesthetist.

The only thing I would criticise in this article is the absence of any remarks on local anesthesia. From my own experience during the past twenty-one years, I am confident that local anesthesia, if not essential, is helpful in all operations.

Many operations may be performed under local anesthesia alone. When this is difficult or impossible, the combination of local with general anesthesia reduces the amount of general anesthetic employed. Whether one agrees with Crile or not, as to the effect of local anesthesia on traumatic shock, its helpfulness to the general anesthetic should be sufficient to justify its routine employment in many operations, perhaps—ultimately—in all. I am inclined to think that Gwathmey does not mention local anesthesia because the surgeons for whom he administers anesthetics do not employ it. Again and again special anesthetists who have worked with me have said: "Your local anesthesia makes our work much less difficult, in minor as well as in major cases."

Too much emphasis cannot be placed upon the importance of local anesthesia. I fear that most surgeons have not trained themselves to use it.

Gwathmey warns that chloroform should never be used alone, or as a terminal anesthetic. It is often the most satisfactory drug and safe for initiatory anesthesia. I think everyone will agree with him. In my more recent experience, I find that I am employing drop chloroform in the so-called waking or talking anesthesia more frequently in operations on the face, jaw, and tongue, always combined, however, with local anesthesia. Although up to the present time my experience with intratracheal anesthesia is but slight, I prefer the former to the latter.

In all forms of anesthesia, Gwathmey emphasizes the help given by morphin hypodermically about one-half to three-quarters of an hour before the operation is begun. He also recommends the administration of oil of bitter orange-peel vapor preceding all general anesthetics. It masks the odor of the following anesthetics, seems to allay fear and reduce the postoperative discomforts. I have had no experience with it. It may, however, prove a so-called fancy accessory. Gwathmey also favors the warming of the anesthetic agent, its combination with oxygen, the utilization of carbon dioxide and rebreathing. His most important statement, however, is that at the present time there are many methods of anesthesia, alone and in combination, and that the anesthetist should be familiar with all of them and their application to different types of individuals and operations.

Another statement of this special anesthetist shows the trend of opinion today. It is as follows: "The combination of nitrous oxide with oxygen with preliminary small physiological doses of morphin, and

a few drops of ether when necessary, is applicable to over 90 per cent. of all surgical cases." I would like to add to the above the combination of this form of general anesthesia with local analgesia.

Space forbids the discussion of the other papers before this new and most-needed association. I would advise every young physician who is called upon to give anesthesia to read with diligence the available literature.

Francis E. Shipway,¹ of London, contributes a criticism of some recent method of anesthesia. The four methods which he discusses are as follows: The intravenous infusion of ether, the intravenous infusion of hedonal, the intratracheal insufflation of ether, and the administration of nitrous oxide and oxygen in major surgery, with thirty references to the literature. The chief danger of hedonal is that it lowers the blood-pressure and is a slight depressant to the respiratory centres. Although there is a large and growing literature on intravenous anesthesia, it has never appealed to me, and for this reason I have never employed it. The intratracheal method of Meltzer and Auer requires special and somewhat complicated apparatus, and should only be given by an expert. This method of anesthesia is enlarging the field of thoracic surgery.

Deaths from Anesthesia. A. L. Flemming² gives a review of 700 deaths from anesthesia culled from the lay press and coroners' inquests. It would have been more interesting if he had been able to ascertain, in these cases, the training of the anesthetist and of the surgeon. However, that chloroform was the anesthetic used in the vast majority of cases indicates the danger of this drug.

Deaths from anesthesia in the hands of an expert anesthetist and trained surgeons are very uncommon, and it is for this reason that it is more difficult today to improve our methods. When the average mortality of surgery is less than 10 per cent. it is very difficult to demonstrate that a better method will reduce it still further.

Collective Review. Walter M. Boothby,³ lecturer on anesthesia in Harvard Medical School, gives a very clear review of the literature on the more important problems of general anesthesia. He discusses the following: The dosimetric methods with chloroform and ether, the open drop method of ether, the anesthetic tension of ether vapor, and the laws governing dosage; warming of ether vapor.

In regard to this latter, he expresses the opinion that it is unnecessary, and that it is more important and practical to keep up the temperature of the patient by keeping him dry and warmly covered, than by heating the ether vapor. A number of expert anesthetists would disagree with him. I have never been able to convince myself that heating was necessary.

¹ British Journal of Surgery, 1914, i, 96.

² Surgery, Gynecology, and Obstetrics, 1914, xix, Abstracts, p. 15.

³ Ibid., p. 117.

Boothby also discusses nitrous-oxide-oxygen anesthesia, and expresses the opinion that it has not been proved that nitrous oxide is absolutely harmless to the kidneys.

By synergism he means the combination of anesthetics, for example the synergetic action of morphin, nitrous oxide and ether, or, carried to its furthest extent, Crile's anoci-association. He gives thirty-one references to the literature.

Local Anesthesia. Balfour¹ is of the opinion that the use of local anesthesia is growing in popularity in America and that novocaine as a substitute for cocaine is partly responsible for this, as it has practically no toxic effects, and can be used in large quantities. Finsterer² brings out the great advantages of the use of local anesthesia in many laparotomies. He agrees with Crile that it distinctly prevents or reduces surgical shock. The abdomen can almost always be opened under local anesthesia without pain. In further manipulation, small quantities of a general anesthetic may be necessary.

Braun³ states that potassium sulphate will strengthen the effect of novocaine as a local anesthetic.

The absence of many references to local anesthesia in the past two years gives me the impression that Balfour is incorrect and that it is not growing in popularity as it should.

HEMORRHAGE.

The chief literature on hemorrhage is concerned mainly with methods of blood-transfusion. Crile, however, has recently contributed a book entitled *Anemia and Resuscitation*.⁴ Space forbids a résumé of this splendid contribution.

Blood-transfusion. Edward Lindeman⁵ gives a preliminary report of a new method in which he uses a simple syringe with special cannula. The blood is aspirated from the vein of the donor and injected into the vein of the recipient.

The apparatus consists of two sets of cannulas, two tourniquets, and twelve syringes.

Two sets of cannulas are employed: one for the donor, the other for the recipient (Figs. 33 and 34). There are three cannulas to each set (Fig. 34, 1, 2, and 3). Each cannula telescopes within the other as shown in Fig. 33. The innermost cannula is practically a hollow needle. The hollow needle (Fig. 34, 1) is fitted snugly into cannula 2; cannula 2 is 5 mm. shorter than the needle and is fitted snugly into cannula 3. Cannula 3 is 5 mm. shorter than cannula 2. The proximal ends of

¹ Surgery, Gynecology, and Obstetrics, 1914, xviii, Abstract, 572.

² Ibid., 127

³ Ibid., 230.

⁴ D. Appleton & Co., 1914.

⁵ American Journal of Diseases of Children, 1913, vi, 28.

1 and 2 are capped with stationary thumb-screw caps. The proximal end of cannula 3 is capped with a receiver to fit any Record syringe. In very small infants with very small veins, only cannulas 1 and 2 are employed, 2 being capped with the receiver to fit the syringe.

The syringes used are Record syringes with a capacity of 20 c.c.

The method of procedure is as follows: One operator manages the syringe of the recipient, another operator the syringe of the donor. An assistant stands between the operators. Donor and recipient are placed in a recumbent position. In adults and most children over two



FIG. 33

years of age, the median basilic veins are selected; in infants, the external jugular or one of its branches; in some cases, the internal saphenous. The tourniquet is placed in position, the skin sterilized with iodine. The skin is punctured, and the cannula forced into the vein. After the first joint (Fig. 33, *A*) has entered the vein, cannula 1 is withdrawn a distance of one-half inch—this prevents the vessel wall from being injured or punctured by the needle after the vein is entered. With the thumb now on the thumb-screw cap of 2, the cannula is forced farther until the second joint (Fig. 33, *B*) has entered the vein. Then cannula 2 is withdrawn one-half inch. Cannula 3 alone comes in contact with the

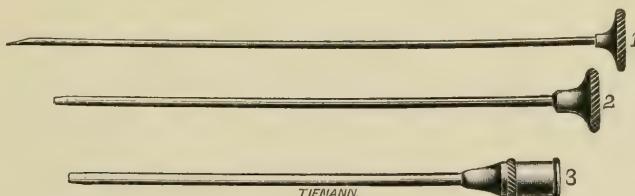


FIG. 34

vessel wall. Then cannula 3 is gently pushed into the vein about three-quarters of an inch. Cannulas 1 and 2 are now withdrawn, and a flow of blood through cannula 3 indicates success. With the appearance of the first drop of blood a syringe containing warm salt solution is attached and the flow of the salt solution maintained through the cannula. This is the technique first for the recipient and then for the donor. Now an empty syringe is substituted for the syringe containing salt solution on the donor and blood withdrawn as rapidly as possible. The syringe is then passed to the assistant. The operator on the recipient removes the saline syringe and substitutes the blood-syringe and

gently injects the blood. This is continued in rapid succession. More than one donor can be employed if necessary.

I give this technique in full, because it appears to be a method which perhaps could be employed successfully by one who has not had sufficient experience or surgical training in other methods of blood-transfusion.

Lindeman reports nine cases, a number of them infants, the remainder children.

The following rules should be followed:

1. The syringes, of course, must be clean and of bright, polished surfaces. Each blood-syringe must be rinsed with sterile water before being employed again. There is no difficulty in avoiding air. The tourniquet on the recipient is removed after the vein is entered, the tourniquet on the donor remains. It may, however, be momentarily released if necessary. The cannulas are lined with a film coating of alboline. One may use both arms of the donor simultaneously. For subsequent transfusions the same vein can be employed. No skin incisions were found necessary. In a footnote he records an increase in the number of his cases to thirty-six. There were no complications.

The abstraction of blood for a Wassermann reaction and the intravenous injection of salvarsan is making a large number of physicians expert enough to attempt this operation. I have had no personal experience with it, and up to the present time have always employed direct transfusion by arterio-venous anastomosis. It is my opinion, however, that all of us, both physicians and surgeons, should embrace every opportunity to become expert in intravenous aspirations and injections without exposure of the vein by open incision.

Andre Crotti,¹ in his method of **INDIRECT TRANSFUSION OF BLOOD**, exposes the veins of the donor and recipient by direct incision under local anesthesia. The vein is dissected out and cut at the upper end of the incision. The proximal end is ligated with catgut, three small mosquito forceps are applied to the cut distal end with a temporary clamp above to prevent hemorrhage. Then, with a Record syringe and a blunt aspirating needle, blood is aspirated from the donor's vein and injected into the recipient. Each time the syringe is washed in normal salt solution.

Perhaps the less experienced physician may find this method easier in an emergency.

Fig. 35 shows the application of the clamp and mosquito forceps to the cut vein.

Bernard Francis McGrath,² from the Mayo Clinic, describes and illustrates a simple apparatus for transfusion by the aspiration-injection method. Fig. 36 illustrates the rubber bulb with the tips for insertion into the veins of donor and recipient; Fig. 37 the bulb filled with salt

¹ *Surgery, Gynecology, and Obstetrics*, 1914, xviii, 236.

² *Ibid.*, 376.

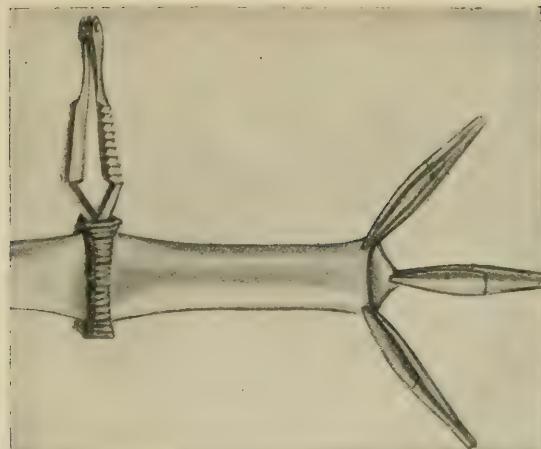


FIG. 35.—Mosquito forceps and artery clamp to be applied to vein.

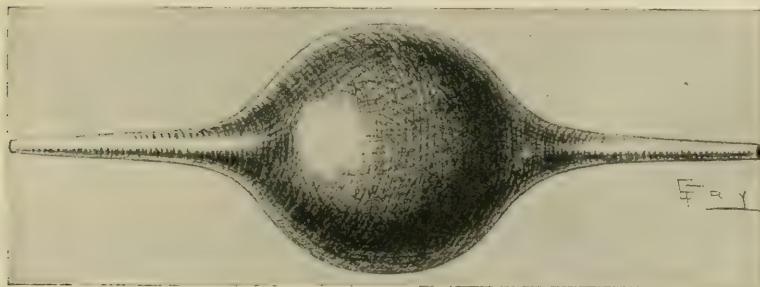


FIG. 36.—Rubber bulb (about 30 c.c.) and tips for insertion into vessels of donor and recipient. No points.

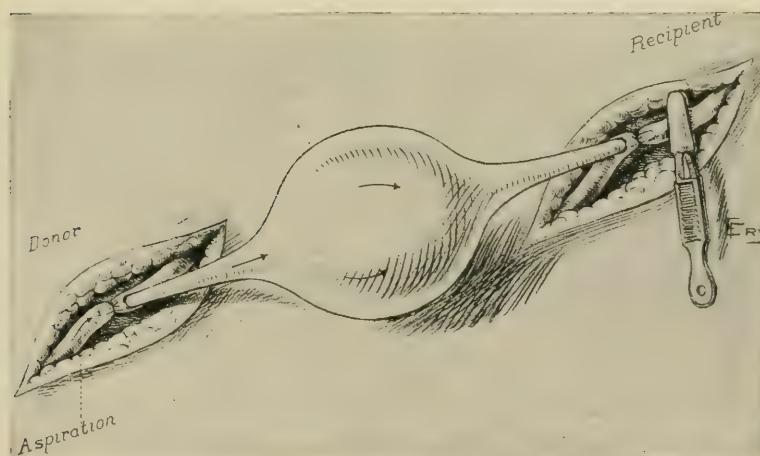


FIG. 37.—Apparatus filled with salt solution and tips fixed in vessels by ligatures. Salt solution expressed and serrefine clamp applied to recipient's vessel. Aspiration from donor's vessel until bulb is filled with blood.

solution and fixed into the vessels by ligature, the salt solution expressed and the clamp applied to the recipient vessel. Now aspiration from the donor's vessel until the bulb is filled with blood. In Fig. 38 the clamp

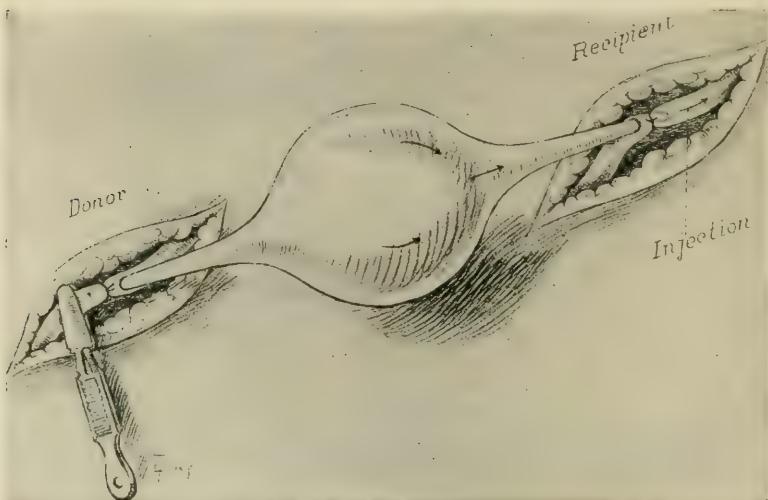


FIG. 38.—Serrefine clamp changed to donor's vessel and blood injected into recipient.

is changed to the donor's vessel, and the blood is injected into the recipient. This is Aveling's method, and McGrath has found it successful in his experimental work. He reports no cases on human beings.

WOUNDS. LOCAL EFFECTS OF INJURIES.

Gunshot Wounds. The present war will excite great interest in military surgery. When I was in London, in August, and was called upon to make an address before a committee on the necessary preparation for the treatment of injured, I took the opportunity of reading the available recent literature on this subject.

The surgical treatment of almost all the injuries possible in time of war is pretty well established. The difficulty is that it is often impossible to follow the best treatment because of the environment of the injured. The best materials may not be available, the injured cannot always be treated at once, and it is difficult to establish near the constantly moving firing line an operating outfit similar to that of a civil hospital.

The problems, therefore, chiefly concern the meeting of an emergency not encountered in civil practice.

All of the writers emphasize the importance that the transportation and care of the wounded must not interfere with the transportation of food and fire-arm supplies to the fighting army. At first sight it might

seem inhumane that the injured should receive secondary consideration, but there is no question that the uninjured fighting men must be kept constantly supplied with food and ammunition. Then, again, cars and other conveyances which will do to carry food and supplies, uninjured troops and horses, would not always do to bring back the wounded. So, if possible, there should be a separate means for the transportation of the wounded.

The majority of injuries are inflicted on the firing line, and the character of the wounds varies. Most writers state that 60 per cent. of the wounded are but temporarily incapacitated, and if these soldiers are properly treated at once and infection prevented, they will be available, some in a few hours, others in a few days, to return to their regiment. The firing line, therefore, should be supplied with sufficient first-aid packages and a sufficient number of surgeons and male orderlies to give immediate attention to this, from the stand-point of warfare, most important group of wounded. The ordinary first-aid package contains some sterile gauze and pieces of adhesive straps. This dressing, of course, only prevents secondary infection. It is now well-known that nothing will prevent a primary infection, but in the average wound upon the average healthy human being the primary infection is taken care of, unless some foreign body is carried in. Most authorities are of the opinion that it would be well to have this gauze saturated with some antiseptic, as this would aid in preventing secondary infection. It would add to the efficiency of the first-aid treatment if the area about the wound could be sterilized with iodine and the gauze saturated with alcohol. But when the number of wounded is large, it would probably be very difficult to keep enough of these drugs on the firing line. Undoubtedly we will know more about this when the war is over.

There is no doubt that if this 60 per cent. of slight injuries could receive the very best treatment on the firing line or the first hospital station, it would add to the efficiency of the available fighting men. Inhumane as it may seem, the more seriously injured soldiers who will be of no further help in the war are a burden to the fighting army. Of course, they must receive treatment, but the larger group needs attention first.

This point is often lost sight of by even military surgeons, and is practically not considered by what we may call voluntary civil help. Those who are offering to help the armies in the field are spending most of their money and energy in preparing for the treatment of the most seriously injured far from the firing line. Important and humane as this may be, the other problem deserves first consideration. That is, there should be on the firing line sufficient first-aid material, surgeons and orderly-dressers to take care of the first treatment of the wounded. No one will disagree that the ultimate result depends more on the first treatment, than any other factor over which we have control. Yet, in mili-

tary practice this is not only most difficult, but it has not received the concentrated attention it deserves.

Next comes the problem of the treatment of the more seriously injured and of those who can no longer walk on account of the nature of the injury. The majority of the latter are injuries with fracture of the lower extremity.

The wounds are often too large to be properly dressed with the ordinary first-aid package. Material necessary to fix the fractures is more bulky in spite of all the emergency methods, and therefore more difficult to keep in sufficient quantities near the firing line.

The transportation of those who cannot walk from the firing line to the first dressing hospital, must be by stretchers. In this war, however, it may be found that automobile-ambulances will be available. From the first dressing hospital the transportation, if possible, should be by automobile-ambulance to the next larger receiving hospital, and then again to the larger hospital either by train or boat where the wounded remain under the protection of the Red Cross flag.

One, therefore, can see at a glance that the treatment and transportation of the injured whose wounds are so serious that they are no longer helpful on the fighting line, is a much more difficult problem in every way, and if those in charge of this allow their sympathies to guide them rather than their best judgment, the immediate treatment of a larger and more important group of injured may be neglected.

In the battle of Mukden there was a large number of deaths from tetanus, but it is stated that the Russian army had no supply of tetanus antitoxin. What has been done in the present war in regard to this, I have no data. The antitoxin could easily be given in the first or second hospital stations.

The stretcher for the first transportation of the wounded is another difficult problem, and there have been many new devices to make them into as small and light a package as possible. There is one stretcher which consists of canvas and straps without poles. This is light and makes for a small package. In the second type the poles resemble jointed fishing rods. Both of these types are better than the old stretcher, cumbersome on account of its long and heavy poles.

There are many devices for the utilization of bicycles equipped with stretchers.

Of course, if the character of the ground allow, the automobile-ambulance is the most efficient means of transportation. When trains are employed to carry the wounded they need special fittings and stretchers, and at this point we come in contact with other uses of the railroad and its equipment. A car well adapted to carry many soldiers to the front is not especially good to bring back the wounded, although stretchers can be placed over the tops of seats.

At sea, transportation is less difficult, and specially equipped hospital

and ambulance ships have become part of the modern navy. I had the opportunity of inspecting one in the Alberta docks below London on the Thames. The transport ship "Sudan" had been "gutted" of all her partitions and bunks. On each deck there were arranged wire cots or bunks suspended from uprights. The bunks had sides very similar to the Gloucester hammock, but of heavy wire. Each bunk was fitted with a mattress and a food tray which could be fixed across the sides. The aisles between the bunks were sufficiently wide to permit the attendants to administer to all the needs of the injured. The ship was equipped with an operating-room and all the necessary apparatus for the treatment of the most seriously wounded. But this ship had accommodations for only about two hundred. The absence of partitions made the ventilation excellent, and the swinging cots will undoubtedly lessen the discomforts in heavy seas.

Here we have the most humane and ideal method of transportation, but only available for the wounded of the fleet and those of the army near a seaport.

This ship was painted white with a wide green band interrupted by a red cross near the bow. The English fleet was apparently fully supplied with such ships, because offers of more of them were declined.

I also had the opportunity to witness the method of changing a passenger ship into an ambulance. We boarded the "China." Her deck officer said: "We came in yesterday from Bombay with the mails. An official of the Navy Department boarded us, painted us white, and said: 'You are a Hospital Ship. The "China" will be gutted, refitted and put to sea within less than a week ready for the care of the wounded.'"

Practically nothing was going on in the Alberta docks but the refitting of ships to be utilized as hospitals, for the transportation of wounded.

It is simplicity itself to write on the transportation of the wounded from the firing line to the last hospital, but, although I have had no experience, I am confident from what I have read of the experience of others, that the practical application is often most difficult. In some battles the number of injured is far out of proportion to the number of people prepared to care for them. For example, we are now reading in the papers that the wounds of German injured are showing a larger per cent. of suppuration than the wounds of British or French injured, and the attempted explanation is the different character of the bullet. It is my impression, however, that the number of German wounded is so much larger that they cannot receive the same attention on the firing line. The longer the period between the infliction of the wound and its first dressing, the greater the danger of secondary infection from suppuration.

As stated before, in at least 60 per cent. of the wounded the wounds are slight, and all that is required is the first-aid dressing. Of the remaining, more serious injuries, the larger number are fractures, and these, of course,

compound. Many of such wounds, however, do well, if they receive immediate attention: First, the covering of the wound with the first-aid dressing and, second and just as important, the proper fixation of the fractured bone. If the limb is not properly fixed, any movement allows the broken fragment of bone to make fresh lacerations on the surrounding soft parts with possible injury of bloodvessels and nerves. Perhaps in no other group of injuries is the first aid more essential. The dressing of a fracture on the firing line will always be a difficult procedure. It is difficult enough in hospital practice, even with the assistance of anesthesia. My reading teaches me that fractures sustained and treated on men-of-war where efficient first aid is better, show far more satisfactory results than similar gunshot fractures on land.

The treatment of hemorrhage on the firing line will always be a difficult procedure. For hemorrhage from the extremities, the tourniquet can be employed. Later, at the first receiving hospital, some minor operative work will be possible, but injured soldiers requiring larger operative intervention for the checking of hemorrhage will probably rarely reach the hospital in which the necessary operation can be done.

There is much discussion in regard to the treatment of shock, but this will always be difficult. Undoubtedly morphine can be given hypodermically, but hot-water bags, extra blankets, salt solution for infusion, blood-transfusion will hardly be possible, except in a few selected case under special favorable environment.

The bad results and the mortality of wounds in actual warfare are due chiefly, therefore, to the difficulty of applying modern surgical methods at the time when these methods will yield the best results. As the delay in treatment increases and as the distance of transportation becomes greater, the opportunity for helping the more seriously wounded grows less and less.

Of course, from the stand-point of humaneness, everything should be done for the comfort of these seriously wounded men, but my impression from reading on modern military surgery is that in modern warfare where large numbers of men are wounded the chance for the more seriously wounded becomes less and less. Those that really need help least from the stand-point of the seriousness of their injury should really be helped most, because it seems possible to give this 60 per cent. efficient treatment and thus preserve a large number of fighting men.

RED CROSS. Dumont, in Geneva, in 1863, made the statement that voluntary aid in the time of war was essential. This gave rise to the formation of the Red Cross Relief Society which is now well-established all over the world. Florence Nightingale has already, by her heroic example, shown what can be done.

The Medical Branch of the Army and Navy is never fully equipped with trained men to meet the requirements of war, and the Red Cross

has been organized to meet this deficiency. To illustrate the number of medical attendants required, I quote from Col. Sylvester Bradley,¹ of the British Royal Army Medical Corps: A temporary hospital which can be moved from place to place behind the firing line has beds for about thirty wounded, and for this hospital they assign thirty attendants, doctors, and nurses. Then there is a rest station, especially for first dressings. This has twenty-five attendants; it corresponds somewhat to a surgical dispensary. Some of the wounded, after being dressed, return to the firing line, the more seriously wounded are transported back to the so-called clearing hospital of two-hundred beds; farther back is the general hospital of about 520 beds. Here at a glance you can see the large number of surgeons, orderlies, and nurses required, and the hospitals must also be equipped with cooks and other attendants. All of these, with their paraphernalia, must be transported and fed.

Now, if the fighting army is advancing, it is not difficult to protect all the hospitals and Red Cross stations, but when the army is retreating, the problem becomes a more difficult one, and one will see in the papers many reports that the Red Cross flag has not been respected by the enemy. But see how difficult this will be when the army is retreating. Accidentally, or even by intent, a Red Cross station or hospital might be in the line of fire of a maneuver absolutely essential to the advancing army.

Those, therefore, who volunteer to help in the Red Cross work run risks, perhaps not as great as a soldier on the firing line. The nearer a Red Cross unit gets to a position where it can do the most good the greater the danger they run. It seems to be the rule of most civilized nations today not to allow women nurses in the units and hospitals near the firing line, but the Red Cross staff consists of surgeons, male orderlies, and nurses.

Another difficulty which will explain some of the bad results in military surgery is that it is impossible to get a sufficient number of well-trained surgeons where they are most needed. The voluntary surgeon may be brave and willing to risk his life to help the wounded, but he has not had the training to get the best results and to perform some of the minor surgical operations under the most difficult and trying circumstances.

Still another difficulty in military surgery, especially in the present war, is the possible deficiency in surgical dressings, drugs and anesthetics. The demand has come too suddenly and for such huge amounts that perhaps, in spite of the best transportation organization, there may not be enough supplies to send to the front, or to the various hospitals at different distances from the army and navy.

¹ *Journal Royal Army Medical Corps*, May, 1914, xxii, 562.

In naval warfare one of the most painful and difficult wounds to dress are the result of burns. The dressing of these wounds requires a large amount of material.

Most of the wounded saved from the English boat blown up by a mine were extensively burned. Even in the best-equipped hospitals the dressing of such wounded is tedious and difficult.

The moment hospitals become overcrowded, it becomes impossible to keep them clean, the attendants are overworked, and the dressing material and disinfectants become diminished in quantity, erysipelas and other types of infection, once started, cannot be combated.

This possibility, I feel certain, has been considered, and evidence of this is shown in England by the preparation for rapidly bringing the wounded from the continent and distributing them throughout England, so that the hospitals near the army will not be overcrowded. This maneuver, if well carried out, will undoubtedly save many lives and much suffering.

The most recent and most complete presentation of gunshot injuries is given us by Col. Louis A. Lagarde, of the U. S. Army Medical Corps.¹

Col. Lagarde was one of the first to carry on a series of experiments in regard to the possibility of primary infection from the bullet. I would recommend the careful reading of this book by all civil surgeons, especially by those who are members of the Reserve Corps of the U. S. Army. Lagarde has thoroughly sifted the recent literature, including that of the last Balkan war.

The presidential address before the International Society of Surgery at its fourth meeting in New York, in June of this year, is of special interest now, on account of what has happened since. It was delivered by Prof. Dr. Antoine De Page,² of Brussels. In the first place, he speaks of the comparative harmlessness of the modern gun and that it has been called a humane weapon, and it is quite true that these bullets may pierce any part of the body without serious consequences either from hemorrhage or secondary infection, but while this has been going on, the cannon have become more deadly than ever. Along with the development of the so-called "humane" rifle, there is also the efficacy of the shrapnels which inflict wounds that are too horrible to describe. This surgeon is of the opinion that the modern cannon should be discarded from modern warfare much more than the older gun. De Page closed his address with the following words: "It seems to me that here, so far away from lands divided by a deadly animosity, you will appreciate this wish as a protestation against the cruelty of war. Yes, I boldly state, that we who are brought into such close contact with the dreadful misery of this poor human race find it more and more difficult to understand why men do not employ their reasoning powers

¹ Gunshot Injuries, William Wood & Co., 1914.

² Annals of Surgery, 1914, ix, 137

to a good end by ceasing this destruction of one another. We hope soon to see the United States of Europe in friendly intercourse with the United States of America."

Accidental Wounds. The modern treatment of such wounds has been discussed pretty extensively in my previous contributions to PROGRESSIVE MEDICINE, and I find very little of interest in recent literature. However, from my own experience, conversation with, and observation of the work of, my colleagues I find an increasing tendency to the open-air or water-bath treatment of large wounds which cannot be closed, wounds with extensive lacerations and burns. When these patients first come under observation they are often shocked, and this shock is increased when one attempts to disinfect the extensive burn or lacerated wound. It would be difficult to imagine that any form of disinfection could remove all bacteria that may have entered. Surely, it is unnecessary in the burn, and in a lacerated wound in which the dirt may be ground deep into the tissues nothing short of complete excision of the injured tissue would remove the dirt. It requires courage not to interfere. The public are educated to interference and disinfection of smaller wounds and cannot understand why this should not be applied to larger wounds. Such patients should be placed on a sterile sheet, covered with an inverted crib, and this covered with another sterile sheet. If possible, their position should be such that they will not rest on the wounded surface. This is sometimes impossible, especially in burns. This air treatment does well for the first two or three days, but when the secretion begins, it dries, scabs form, and there is retention of the secretion between the scab and the granulating surface before the granulating tissue has become protected against absorption. If we force the air treatment now, the patient may show fever and other signs of septic absorption, and complain of stiffness and uncomfortable sensation in the wound.

In this period, usually at the end of the second day, there should be a slight change. The patient can be placed in a tepid bath for a few hours once or twice a day, and in this immersion the scabs float off and the secretion is washed away. Some patients prefer to remain in the bath, others prefer to return to their position between the sterile sheets. In other cases I have found that the covering of the wound with some liquid substance answers the purposes of the bath. Liquid boric vaselin, in my experience, seems best. Children sometimes fear the bath treatment, and are tremendously excited by it. I believe it is a mistake and an unnecessary trouble and expense to dress these huge wounds as we would dress a small open wound. In many adults and in all children this dressing is an ordeal.

Should the signs of general infection be marked, it is a good plan to give these patients light gas anesthesia, disinfect the necrotic surface of the wound with iodine, wash this off with alcohol, irrigate with salt

solution. This is not often necessary, but, in a few cases in which this indication was present, I have found it very efficacious. Of course, it would not abort a beginning attack of erysipelas. But this rather strenuous treatment gets rid of sloughing tissue, disinfects pockets, and leaves a more open surface.

It is surprising how little the average interne knows about the treatment of open wounds in the beginning of his surgical experience.

Of course, the majority of wounds seen today are closed, and, as a rule, heal without suppuration. But the open accidental wound or burn, and some operative wounds first have a period in which there is sloughing of tissue, then the period of edematous granulation tissue, then that of contraction, and, lastly, of slow epidermization. The literature is full of drugs which are helpful to these stages, and yet few stand the test of time. These drugs are exploited chiefly by their manufacturers.

For example, the past winter I resected a larynx for recurrent carcinoma, and, on account of the extent of the disease, the dissection was unusually large, and the suture of the opening in the pharynx did not heal. We had, therefore, an open, infected wound from the beginning, constantly soiled by saliva from the mouth and secretion from the trachea. The patient had to be fed by a stomach-tube. The resident in charge of the ward, who was more than usually competent and ambitious to meet all his obligations to the last detail, was constantly asking me why I left the wound alone, why we did not do this and did not do that. I told him to keep the skin about the wound clean for looks, keep the flies off the wound and leave it alone, and to observe the healing of the wound by granulation. He grew more and more impatient at the slowness of healing, because he thought something could be done to hasten it. Then to his surprise and without his aid the stage of contraction began, the edges of the wound, as if by magic, came together slowly, the opening in the pharynx became so small that the patient could swallow, and with a good granulating surface, epidermization took place rapidly.

Before this healing was quite complete, a second case of laryngectomy came under his care and observation, and after both were healed, he remarked to me: "I have learned more from the healing of these two cases than from all the other wounds that I have seen up to date, and with my knowledge of the course of healing in the first case, I was well prepared for that in the second, so that I was not impatient and critical of your apparent lack of interest, and your attitude of non-interference."

When a wound is wide-open and the patient is in clean environment, healing, as a rule, takes place progressively well, provided there are no secondary invaders, the most common of which is the streptococcus, giving rise to erysipelas. Fortunately, this complication seems to have disappeared. I observed it in the wards of the Johns Hopkins Hospital

off and on until the time when we began to wear gloves and to dress wounds with sterile instruments and not with our fingers, and yet we had used more disinfectants in that period than we do now.

We cover a little open wound with dressings, because it allows the patient to get about, but when we have a big wound and the patient must remain in bed, I believe this open treatment to be better. The moment you dress a big wound, there is danger of the dressing remaining on too long, and it never looks as clean when dressed, even after a short interval, as the uncovered wound protected with sterile sheets over a crib.

Operative Wounds. The technique of the preparation of the skin of the patient with iodine seems to have been pretty uniformly adopted. Many surgeons combine this with alcohol and partially wash the iodine away with it. In the preparation of the hands of the surgeon, alcohol is becoming the antiseptic of choice. Solutions of bichloride and carbolic acid are rapidly disappearing from the operating room. In some of the London hospitals the carbolic technique is still used chiefly for instruments. This seems unnecessary, and, in abdominal work, inconvenient, as they must be rinsed in salt solution before use. The employment of dry instruments from sterile sheets seems to be the most uniform technique. Many surgeons keep their needles and knives in alcohol. This, however, is more to prevent rusting, than for disinfection.

The employment of gloves, long-sleeved gowns, caps, and covering for the mouth and nose is rarely neglected in any of the clinics throughout the world.

When we come to the operation itself, we observe some surgeons using dry technique, even of the abdominal pads, while others employ gauze sponges and pads wrung out in salt solution. If the former is just as good, it eliminates a time-consuming maneuver, especially in laparotomies. I observed that the dry technique in abdominal work was the rule in many of the clinics in London.

Many surgeons still fear infection of the wound from the surrounding skin. For this reason, after making the skin incision, towels or gauze are attached by clamps or pins to the skin edge. Other surgeons seem to think that this is unnecessary. I have used both methods alternatingly for at least two years, and was unable to detect any difference in the result. There is no objection to it, but there is no apparent danger from its neglect, unless it consumes time or interferes with more important technique.

A number of surgeons throw away the first knife employed for cutting the skin and reboil instruments from time to time if the operation is a long one. Theoretically this seems correct, but practically, in my experience, unnecessary in clean work.

There is a number of surgeons, especially in England, led by Lane, of London, and Jones, of Liverpool, who are of the opinion that the

gloved hand should never enter the wound, and everything within the wound should be handled with instruments. Theoretically this also might seem correct. But, from my experience, this is also unnecessary. This technique was established by Koenig before the use of gloves and given up to a large extent after the introduction of rubber gloves.

In some operative manipulations the maintenance of this technique is awkward and frequently at the expense of time and at the risk of making the operative manipulations less precise.

The point that I wish to emphasize is that we must not allow ourselves to be handicapped by tradition or by new methods of enthusiastic surgeons who may have adopted some of the modern methods for spectacular purposes, especially when experience shows that these methods are unnecessary and at the expense of more important manipulations.

This is well shown in operations for resection of the stomach and intestines, and anstomoses between the hollow viscera. Tradition and fear of soiling with intestinal contents have influenced surgeons to use clamps and to spend a great deal of time in protecting the general peritoneal cavity with gauze pads, often at the expense of a precise and careful suture. In the work of others, and in my own, I have found that as our experience increases, we are giving up clamps when they interfere with easy manipulation, and are spending less precious time in protection with gauze pads, but concentrate our attention and energy on the intestinal suture. With this change there seems to be no doubt that the results are improving.

I do not wish to put myself on record as objecting to any method of technique which protects the patient from infection, but I am quite confident that, with careful observation and the checking of our results we will find that some of our protective measures are unnecessary. An investigation of this kind is along the line of efficiency and for the best interest of the patient.

Wound Dressing. The history of Lister's methods show that the dressing of the wound became more and more complicated until finally there was a number of layers of gauze saturated with different antisepsics, separated with some kind of rubber tissue.

When asepsis was substituted for antisepsis, we still retained cumbersome dressings.

Up to the present time there is still a difference of opinion as to whether the wound should be covered with a dry dressing (asepsis), or with some substance, such as ointment and gauze, impregnated with antisepsics.

It seems, however, to be the consensus of opinion today that all closed, clean, operative wounds and many of the minor accidental wounds do just as well under a first dry aseptic dressing. But when the accidental wound is infected, or infection is probable, a moist antiseptic dressing, or a slightly antiseptic ointment provides better for the

drainage and the disinfection of the organism in the excretion from the wound.

The same seems true in regard to operative wounds made for infection, or in which infection is expected for some reason or other, or which have become secondarily infected.

Nevertheless, there is sufficient difference of opinion, both as between moist and dry dressings, and between the different antiseptics, to make one conclude that in many of the methods there are inessential factors, and when good results are obtained by many different methods, one, of course, looks for the factor which is common to all, because the probabilities are that this will be the essential one.

CLEAN WOUNDS. After the introduction of rubber gloves, the healing of clean operative wounds reached a degree of perfection unattained before and not surpassed since. From my own observation in my own clinic, and in the clinics of others, I am forced to conclude that the healing of our closed, clean operative wounds is not as uniformly perfect now as they were five or more years ago.

I do not think this is due to any change or fault in asepsis or antisepsis, but to the fact that we have much more to do than formerly after the wound of exploration has been made, and that our interest in wound healing has lagged. I fear also that we have been less careful in absolute hemostasis, and that catgut has been used more frequently than silk. Personally, I have returned to Dr. Halsted's technique and employ fine silk for ligature and suture. I have almost given up catgut. When I want a stronger material than fine silk, as in laparotomy wounds, I prefer the through-and-through suture of heavy silver wire which can be removed.

The fault in healing today is chiefly due to hematomas which become secondarily infected. I will not dwell upon this longer, but I would suggest to each surgeon who reads this page to look into his own results, and if these are not as satisfactory, as they were or should be, to substitute fine silk for catgut and to use unusual care in hemostasis.

After the clean operative or apparently clean accidental wound is closed, the majority of surgeons prefer the dry dressing. The amount of this dressing varies. The less the secretion expected, the less the dressing. In the majority of instances, surgeons prefer adhesive straps to hold this gauze in place. Carrying this procedure to its greatest simplicity, surgeons are using less and less gauze, some adhesive straps only, and now there is being suggested a substitute for adhesive straps called the "mastic" dressing which I will discuss later.

The rapid substitution of the iodine treatment of the skin for all other methods is a good indication that any simplification of technique will be rapidly adopted provided it is just as efficacious. It is difficult to conceive of a much simpler preparation of the skin than painting it with iodine, unless we do nothing at all. Nevertheless, the methods employed before iodine, were just as good, but not as simple.

We must bear this most interesting and instructive observation as to iodine in mind. From my personal experience our results in wound treatment are good but usually by no means simple or economical. It is expensive both in time and material.

We would be much better prepared for war surgery if we gave more time and thought to simplifying wound dressing, in order to obtain a method requiring the least bulk in material and the least time of the surgeon. On the battlefield, a dressing of this kind must be adopted. Von Bergmann revolutionized military surgery when he instituted the small, first-aid packages.

We do not, therefore, look for better results from any change in the dressing of our clean wounds, but to equal results from a simpler and cheaper method.

From a number of clean wounds we may expect a certain amount of secretion. In wounds of this kind, it still seems to be the general opinion that a dry dressing is sufficient. But the surgeon puts on more gauze and thus lengthens the time before redressing is indicated. Most surgeons still fear the danger of secondary infection in redressing fresh wounds within the first few days.

It is difficult to have such a wound always redressed in the environment of an operating room, or always by the same experienced surgeon. Personally, I still take this view, although it is perfectly possible to redress a fresh wound with just as much safety as after making it in the operating room.

In wounds of this kind, I believe the extra time and material justified by the additional protection afforded.

As long as there is secretion from the wound, it is my opinion that the skin about it should be disinfected with alcohol at each redressing and the wound handled entirely with sterile instruments.

If there is any tendency to cake and to backing up of this sterile secretion because of the dry dressing, a moist dressing or ointment should be placed next to the wound. I have tried both gauze saturated with salt solution and gauze saturated with alcohol and other disinfectants, but I have been unable to see any difference in healing.

It seems, therefore, in hospital practice at least, unnecessary to employ antiseptic dressings to cover clean wounds, even those from which there is some secretion, but the possibility of secondary infection must always be borne in mind when such wounds are redressed. The fresher the wound the greater the danger of secondary infection, especially in the presence of oozing. The same care, therefore, should be employed in dressing such a wound as in making it, and at each redressing the skin about the wound should be cleaned. The majority of surgeons prefer alcohol, many are now employing iodine. My assistants at the clinic in St. Agnes' Hospital are now favorable to iodine along the line of incision over the stitches that have not been removed, but I am

confident that the most essential feature in the redressing of a clean wound is the prevention of any contaminating object coming in contact with the wound.

Few surgeons employ Halsted's silver foil. It adds to the expense of wound dressing. I am not certain that it is an essential adjunct. For three years, at St. Agnes' Hospital, I have given up its employment as a routine in laparotomy wounds, using it alternatingly, or from time to time. I have been unable to note any difference. For small wounds anywhere, especially on the face, silver foil covered with cotton or crêpe lisse or chiffon and fixed with collodion is not only a simple dressing, but one that is not unsightly and cumbersome.

It seems to be the opinion of the majority of surgeons that the healing of a clean operative wound is not influenced by the first dressing, providing that this dressing is aseptic. This healing depends upon the technique of the operation. All surgeons agree that in the fresh state such a wound can be secondarily infected, so that, other things being equal, the longer such a wound is left alone, the better.

UNCLEAN WOUNDS. As to the dressing of these wounds, one finds, even in the recent literature, a greater difference of opinion than in regard to clean wounds.

In this group it is more difficult to judge of results. In clean wounds we expect uniformly good healing. If anything happens to the contrary, someone has blundered. But there are so many factors in the unclean wound that it is very difficult to judge the effect of the different treatments on healing.

The majority of surgeons are of the opinion that such wounds should be more or less open, the dressings should be more frequent, some form of antiseptic should be employed at each dressing, and that perhaps the gauze which is placed over the wound should be moist and saturated with some antiseptic. Gauze dressings should be prevented from sticking by the application of some ointment or lubricant, or, as I have just stated in discussing accidental wounds, the wound should be left open to the air and not covered with a dressing at all.

THE MASTIC DRESSING. It is quite possible that this simple method, applicable for the dressing of most accidental and operative wounds may win out, as iodine has in the disinfection of the skin.

Gum mastic is a resinous substance obtained from the mastic tree and not expensive.

According to the researches of M. Borchardt,¹ the mastic solution in benzole recommended by von Oettingen is germicidal and no bacteria grow in it. The preparation recommended by Borchardt is:

Pure selected gum mastic	40
Benzole	60
Castor oil	20 drops

¹ Beitr. z. klin. Chir., 1913, lxxxvii, 453.

This should be filtered and made up to 100 parts.

Krebser¹ gives von Oettingen's original formula in which chloroform was the solvent, but benzole has been found to be less irritant. There is a substance on the market called *mastisol*,² but it is patented and more expensive and, according to Borchardt, no better than the formulæ given above.

This mastic solution is applied to the skin, very much as we apply collodion, with a brush; after a few seconds it sticks, and, as a rule, remains pretty well fixed to the skin for about eight days. It is therefore, not unlike adhesive-strap dressing. In accidental wounds, according to Voos and others, it can be applied as a first-aid dressing, in some cases used to close the wound as well as to cover it. If a little of the mastic leaks into the open wound, it does no harm. Slight secretion can find its way out. If one wishes to provide for more secretion, the wound can be covered with a little sterile cotton. After applying this mastic to the skin, if one wishes further fixation, a bandage can be applied which sticks to the mastic, but in many cases this is unnecessary. In accidental wounds it is not necessary to disinfect the skin before applying the mastic. In operative wounds, the iodine-alcohol technique does not contra-indicate the later dressing with mastic, in fact in some cases the mastic can be applied without disinfecting the skin, covered with a thin layer of gauze and the incision made through this, so part of the dressing is applied before the wound is made.

E. Dietsche³ gives the technique which has been employed for about one year in Meisel's clinic in Constance. The day before operation the skin is shaved and the patient is given a bath; in emergency cases the bath is omitted and the shaving is done with ether. Before applying the mastisol, the skin is cleaned with ether. Dietsche does not consider this essential for asepsis. The mastisol is painted on the skin with a brush or a piece of cotton fixed in an artery clamp and forms a thin layer which is transparent, so that it does not interfere with the line of incision, or destroy pathological or anatomical landmarks. It is allowed to dry one minute. Then a single piece of gauze held at the four corners and stretched moderately is placed over the film of mastisol and fixed by gentle sponging with a piece of sterile gauze. The incision is made as usual. When it is time to close the wound, the gauze near the wound is pulled away. When the wound is sutured, the entire gauze is pulled away leaving the film of mastisol, and now a second piece of gauze or bandage will stick and act as a fixation dressing.

Boerner⁴ reports very favorably on the mastic treatment. Jaquet,⁵ the most recent report, recommends it both for the skin of the patient

¹ Beitr. z. klin. Chir., 1912, lxxix, 129.

² G. W. Voos, Centralbl. f. Chir., 1911, xxxviii, 901.

³ Centralbl. f. Chir., 1914, xli, 1.

⁵ Ibid., 1914, xli, 34.

⁴ Ibid., 1912, xxxix, 147.

and the hands of the operator. Hanasiewcz¹ agrees with Jaquet. In the preparation of the hands with mastisol, the solution is poured into the hollow of one hand and then rubbed over both hands and forearms. When it is fairly dry it can be partly relieved of stickiness by rubbing it with sterile gauze or covering it with sterile talcum powder. Then cotton gloves are worn. After operation, the mastic is removed with olive oil or benzine.

Heist² recommends the application of tincture of iodine first and then of the mastic to the skin in the field of operation. Apparently the majority who employ mastic are of the opinion that the iodine is unnecessary. The reviewer fears that the combination would lead to eczema, but I find no reports on this complication.

STEROLINE. Richard Frank³ gives a combination which he calls *steroline*. It is to be employed both for the skin of the hands and of the field of operation. The principle is similar to that of the mastic preparation, but the solution is not sticky and therefore is better for the hands, because it can be used repeatedly. Frank states that since its employment in his clinic all the expensive plumbing apparatus has remained unused. This, of course, makes it most applicable for emergency and war surgery, where it is difficult to employ soap-and-water cleansing. As a matter of fact, tincture of iodine has removed from most operating rooms the former, longer and more cumbersome methods of soap-and-water cleansing, during which it was difficult to keep the patient dry. Our present methods of cleaning our hands are good, but take time, and in some emergencies soap and water are difficult to get. This steroline solution is of a brownish-yellow color. The skin of the patient can be shaved dry. The surgeon first rubs the solution on his own hands, while it is evaporating he rubs it on the skin of the patient, then he goes over his own hands and forearms again, and then the skin of the patient a second time. Then the surgeon puts on cotton gloves, gown, etc. No sticky substance remains. It apparently has all the advantages of iodine, but none of its disadvantages and can be used for the hands repeatedly. The surgeon's hands remain soft and uninjured.

The formula for steroline is as follows:

Balsam of Peru	4 gm.
Castor oil,	
Venetian turpentine	aa 2 gm.
Glycerin	1 gm.
95 per cent. alcohol	100 gm.
	M. D. S. Steroline.

In the list of operations there are 114 hernias. This operation is one of the severest tests of technique.

¹ Centralbl. f. Chir., 1914, xli, 70.

² Ibid., 1912, xxxix, 147.

³ Ibid., 1914, xli, 1249.

Should this solution—steroline—prove to be sufficient for the cleansing and disinfection of the hands of the surgeon and of the skin of the patient, operative technique will be further simplified without loss of any safeguard. Frank still uses cotton gloves. Rubber gloves, of course, are expensive.

The efficacy of tincture of iodine has stimulated many minds in surgery toward simpler and more economical methods. As soon as it has been demonstrated that they are equally efficient their adoption will be uniform throughout the world.

Frank has also used this solution over skin painted with iodine. The steroline removes the color of the iodine just as does alcohol, and Frank is of the opinion that when the iodine stain has disappeared it is an indication that sufficient steroline has been used.

SUTURE AND LIGATION MATERIAL. Last year¹ I discussed silk and catgut. I agreed with Halsted that, with few exceptions, silk is the safest and best material for ligating vessels and closing wounds. The recent literature is rather large, and I propose to present it next year. But I take this opportunity to warn my readers again against the routine employment of catgut. It is my opinion that catgut is especially dangerous in closing laparotomy wounds and is largely responsible for the number of postoperative eviscerations and later postoperative herniæ. The recent literature confirms this statement and next year I will be able to present it in a more emphatic way. Time and lack of space forbid doing so this year.

SUBSTITUTES OF IODOFORM. The chief objections to iodoform are its odor in all cases and its irritant properties, even causing general toxic symptoms in some cases. Iodoform, however, has been universally and so long employed that it is hard to believe that it has not some valuable qualities. Iodoform gauze is still widely employed for drainage, iodoform-oil, ointment and powder not as much as formerly, even in surgical tuberculosis.

In the *Centralblatt f. Chirurgie* for 1914, vol. xli, there are four references on a substitute for iodoform: Hermann Janzus (p. 137), F. Loeffler (p. 139), W. Speck (p. 71), and Kaeserbohrer (p. 991), which seem to show that noviform has all the good qualities attributed to iodoform and none of its disadvantages. It has no odor, it does not become changed by sterilization or by the secretion in wounds; it can be used in gauze, as a powder, in an oil emulsion or ointment. If iodoform is really essential for impregnating gauze drains, or for some of its many uses, we have here apparently a substitute. Previous to this there have been other substitutes, but none, so far, has stood the test of time. If noviform is more expensive than iodoform, I do not believe it will displace it, because the discomfort and dangers of iodoform are not

¹ PROGRESSIVE MEDICINE, December, 1913, p. 227.

so great, and today's surgery must be as economical as possible, if, with this economy, the life and comfort of the patient are not at all jeopardized.

Future experience may demonstrate that steroline, mastic dressings and noviform have come to stay, simplifying and economizing the treatment of wounds. In the past, carbolic acid and iodoform have made hospitals and surgical dressings disagreeable to an extreme degree to even an unesthetic sense of smell. An odorless, noiseless hospital, I trust, is not an idle dream.

GRANULATING WOUNDS. There appears to be but little uniformity in the treatment of granulating wounds, sinuses and fistulæ. The treatment varies not only in method, but in drugs. The impressions I have gained from years of experience and wide reading is that the chief things common to all successful methods of treatment are prevention of secondary infection, frequent dressings, and the absence of irritating substances. As I said in the beginning of this review, the open-air treatment meets most of the indications. Space forbids to discuss this question further at this time, but it is a very practical problem, and I wish to state here first, that the employment of scarlet-R has been too widespread for the good that is supposed to come from its use. The fault in the healing of a granulating wound is not of the epithelium about it, but of the granulation tissue. This granulation tissue *must* be kept clean and its circulation maintained, and it is essential that the general condition of a patient with a granulating wound must also be maintained; fresh air and sunlight are as important to one as to the other. When there is much keratosis about an ulcer, especially in *x*-ray burns, scarlet-R or any of its derivatives may be dangerous. It is difficult to prove, but I have seen at least two cases of cancer in *x*-ray burns, that may have been due to the prolonged use of scarlet-R.

In support of the view that fresh air and sunlight are good for granulation tissue, we have numerous articles on the treatment of such wounds with hot, dry air.

Two of the most recent are by Rosiès.¹ Among the chemical methods, tincture of iodine and iodine vapors seem to be emphasized most, but this may be due to the popularity of iodine for cleaning the skin. Among many other drugs, powdered sugar is recommended.

Posner² advocates a treatment which might at least appeal to the fashionable and well-to-do. He covers chronic ulcers with dried and powdered Karlsbad salts. Some recent experiments have thrown great skepticism on the huge literature on bismuth paste and seem to demonstrate that the vehicle is more important than the bismuth.

¹ Centralbl. f. Chir., 1914, xli, 991, 992.

² Ibid., 1042.

INFECTIONS.

General Infection. The diagnostic methods have not greatly increased. Rost and Saito¹ discuss the availability of serologic staphylococci reactions in surgical diagnosis. They are of the opinion that the bactericide and opsonic-index methods are not reliable. The staphylococcal reaction has been helpful to differentiate osteomyelitis from tuberculosis of bone, and is readily made since lysin has been placed on the market by Merck. Of course, when blood-cultures are positive, the organism is present, and such examinations should be more frequently made, but in many local infections, with and without general symptoms, the organism cannot be obtained by cultures from the blood. We really need these methods of diagnosis. Now that we have the Wassermann reaction for syphilis, we can appreciate the value of such methods. Even the less satisfactory method of Widal in typhoid and the various reactions for tuberculosis are tremendously helpful. Many local infections are overlooked until they become general—a stage of the disease in which our methods of treatment yield very unsatisfactory results. Positive methods of diagnosis in these earlier stages would be life-saving.

TREATMENT. A. Campbell Burnham² reports on the vaccine and serum therapy in 111 cases of septicemia treated in the Presbyterian Hospital in New York. He characterizes the methods of treatment of septicemia or bacteremia into two groups. *Chemotherapy* embraces those in which certain drugs are employed. The most effective of these methods is Ehrlich's salvarsan in syphilis. Among the older methods, Credé's collargol given intravenously and other methods with mercury have not yielded the results expected. There have been some reports claiming good results with quinine, others with intravenous infusions with magnesium sulphate for infections other than tetanus. Burnham, however, seems to be of the opinion that with the exception of salvarsan it is questionable whether the other forms of chemotherapeutics have really had much influence on the result.

The second group may be called *Immunotherapy*. In this method the design is to increase the resistance of the patient to the toxins of the bacteria. Burnham's experience is chiefly with this method, although his results do not impress me as very encouraging. The mortality, in his 111 cases, was 66 per cent.

He divides his cases into five classes: (1) Those following abortion and labor; (2) infected wounds and abscesses; (3) osteomyelitis and arthritis; (4) malignant endocarditis; (5) miscellaneous cases.

He has included in all of these groups some cases in which the blood-cultures were not made or were negative. When the organism could not be gotten from the blood, it was obtained from the local region.

¹ Deutsch. Zeitschr. f. Chir., 1914, exxvi, 320.

² Annals of Surgery, 1914, lix, 652.

As an adjunct to the vaccine and serum therapy, he recommends the open-air treatment.

After reading this and other articles, it is important to impress the general practitioner and to educate the public that the diagnostic methods in any type of infection can only be correctly made by an expert bacteriologist, and that the treatment is not devoid of danger and should be carried out by, or under the supervision of, a trained and experienced man.

Personally, I do not feel prepared to comment favorably or unfavorably on the immense literature of chemo- and immunotherapy. From my own clinical experience I am convinced that the factors which influence the result are so many that it is very difficult to come to correct conclusions as to what method of treatment really influences the result. Surgical measures are of help in combating the local infection only. If these are instituted in time, one will rarely have to treat general infection, and the results will be uniformly good. Some years ago, when I went over carefully all the streptococcus infections in the surgical wards of the Johns Hopkins Hospital, I was impressed with the uniform recovery when the patient was in good general condition and with the fact that in the autopsies on those patients who succumbed, the findings always demonstrated some chronic disease which lowered the resistance of the patient. Now, if these two facts are not borne in mind, we can easily see to what fallacious conclusions one might be led. Burnham gives twenty-two references to recent literature.

J. Favel Biehn¹ calls attention to the causes of failure in "bacterine" therapy under the following general heads: Incorrect bacteriological diagnosis; improper bacterine, either stock or autogenous; improper dosage, either size of dose, or interval between doses; and lack of proper concomitant treatment.

It is interesting to note that, in Biehn's opinion, lack of concomitant treatment is the cause of the greatest number of failures.

This should give the physician, untrained in the special methods of diagnosis and treatment, encouragement, because concomitant treatment is a factor over which we have the greatest control. This treatment may be divided into two groups: First, general. The most important factor in the general treatment is the proper control of kidney and intestinal excretion. Now our methods for increasing renal output and intestinal flow are not only simple, but usually effective. Proper fresh air and diet are not difficult to give. The local treatment may be divided into two groups: *non-operative* measures chiefly concerned with hyperemia and improved circulation, and *operative* measures which have for their object either the complete removal of the local infection, if possible, or proper drainage with the local use of antiseptics. Mental

¹ Surgery, Gynecology, and Obstetrics, 1914, xviii, 258.

and physical rest are essential to the preservation of the strength of the individual. These methods are within the reach of all physicians and surgeons. But when we come to the expert methods of diagnosis and the preparation of the vaccines and sera, we need the assistance of the trained bacteriologist interested in this clinical question.

The literature on immunotherapy will be found discussed in PROGRESSIVE MEDICINE,¹ in the chapter on Practical Therapeutics by Landis, and will undoubtedly be thoroughly considered again in this volume.

Local Infections. PHLEGMONS OF THE HAND. The local treatment of infections of the hand and foot is difficult, and good results important, because of the close proximity of tendons, small joints and bones. We have in this country an excellent book on this subject by Kanavel, of Chicago, which I have reviewed some years ago. There is a very interesting recent article by Max Tiegel² from Henle's clinic in Dortmund. Figs. 39 and 40, illustrate a self-retaining retractor useful here, because it is difficult to keep wounds open without packing, and packing is often contra-indicated. Fig. 41 shows a simple and comfortable method of slinging the splinted hand and forearm.



FIG. 39

Perhaps I review this article with greater enthusiasm, because for years in PROGRESSIVE MEDICINE I have advocated an open method of treatment without gauze packing. In a footnote, Tiegel says that, although his self-retaining retractor was conceived independently by him, he finds that it has been advocated by Braatz, of Königsberg, who published it in the *Centralblatt* for 1897, No. 16.

Tiegel summarizes the bad results in the treatment of hand phlegmons unusually well, and the causes are similar to the bad results in surgery everywhere. These causes are factors over which we have control—delay and treatment. The first cause is due to the ignorance or fear of the patient. At the onset, most infections in the region of the fingers, hands, toes, and feet are insignificant. With or without a preceding trauma or wound, there is a small zone of pain and redness. In this stage, the average individual pays little or no attention. When the

¹ December, 1913, pp. 308 and 394.

² Beitr. z. klin. Chir., 1914, xci, 435.

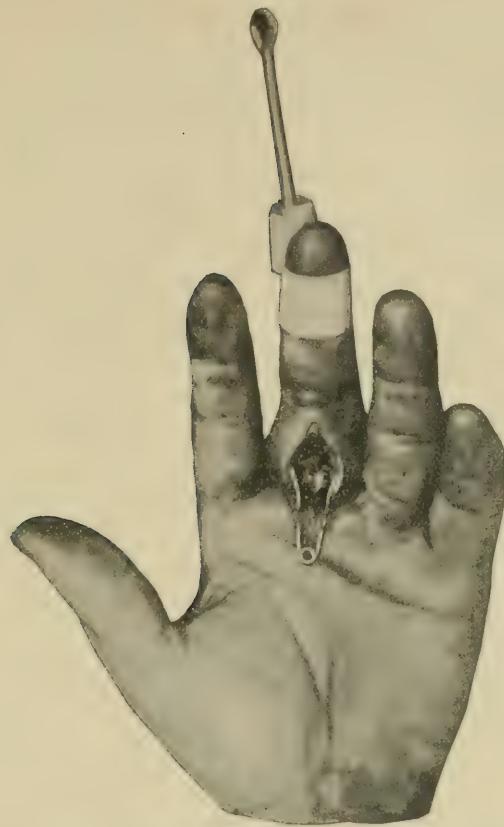


FIG. 40.—Self-retaining retractor and method of employment.



FIG. 41.—Method of dressing and suspending phlegmon of the hand and fingers to avoid fixation from non-use.

discomfort is a little worse and the red area a little larger, he resorts to domestic remedies—the most common is some type of poultice, the most dangerous the wet dressing with dilute carbolic acid. For this reason, most phlegmons are terminal conditions and come to the physician late.

The next factor is faulty treatment. Efficient as are the non-operative measures in some cases, their widespread exploitation have encouraged physicians not trained to operative means to employ them first, so that, in many cases, precious time is lost by further applications of poultices, hot baths, suction, and various methods of hyperemia.

Then, again, when operation is resorted to, the less experienced as a rule makes too small an incision which closes so quickly that the drainage is only temporary and insufficient. Then Tiegel emphasizes the fact which cannot be denied, that the majority of surgeons with large experience still pack these wounds after making an incision. Undoubtedly this is better, but tamponing has disadvantages—the drainage is never as good as in the open, unpacked wound, and the tampon is always an



FIG. 42.—Cramp's retractor-drain.

irritant. The results in the late operative treatment of these phlegmons are bad enough by the best methods, but I am confident, from my experience, that Tiegel is right in regard to the importance of the open wound and the absence of packing. Over these two factors we have absolute control. By publicity and the education of the people, and in our medical schools, we can undoubtedly control and reduce the period of delay and eliminate faulty first-treatment to a considerable extent.

Tiegel also emphasizes the importance, in phlegmons of the finger and hands, of leaving the unaffected fingers free, so that there will not be fixation of the tendons from non-use. This is well shown in Fig. 41.

I am confident that a visit to the large surgical dispensaries in this country would demonstrate that the practice of packing these wounds is the rule.

Apparently, Walter C. Cramp,¹ in the Surgical Dispensary of the Bellevue Hospital, has come independently to the same conclusion, for he describes and pictures (Fig. 42) "a new retractor-drain." It is made of

¹ *Surgery, Gynecology, and Obstetrics*, 1912, xv, 509.

nickel-plated steel, about one-quarter of an inch in width, bent into shape as shown in the illustration, and can be made of three sizes or more. Neither Tiegel nor Cramp have observed that these retractor-drains gave pain, or produced decubitus. Cramp also seems to be opposed to tamponing the wound.

Leroy W. Hoon and George J. Ross¹ summarized 90 cases of infection of the hands treated during six months in 1912 in the Surgical Dispensary of the German Hospital in Philadelphia. They followed pretty closely the line of treatment advocated by Kanavel, of Chicago, and are of the opinion that their results were better than from their previous methods. They found after some experience that Kanavel's advice to make the operation bloodless by the employment of elastic rubber bandages was an unnecessary elaboration. Extensive irrigations after incisions and the forcible squeezing out of pus from deep pockets was not practiced. After single or multiple incisions, the parts were dressed with wet boric gauze. When tendon-sheaths were incised, fixation splints were employed, but passive motion was begun as a rule at the end of forty-eight hours. The hot wet-dressings were kept up for three days, then were substituted by dry-dressings.

Here we have, therefore, a report which demonstrates that, in this dispensary, gauze packing has been given up. Whether their results would have been better if they had resorted to some method of keeping the incisions open, can only be ascertained when these surgeons try the self-retaining retractor and make their own comparisons. They frankly acknowledge that Kanavel's methods gave greatly improved results.

The method which I have employed to keep the incision open is to excise an elliptical piece of skin. Although I have not tried the retractor, yet I get the impression that this simpler method will, in superficial infection, answer the purpose, but for deeper infection I am of the opinion that the retractor will be helpful and I shall try it.

FURUNCLES. The treatment of a single furuncle or boil is generally simple. In the early stage I have used collodion for years. The area is washed with alcohol, covered with a bit of cotton and painted with collodion. This is practically a hyperemic treatment, and I see it is advocated by Fuchs.² If signs of resolution do not rapidly appear, or spontaneous rupture takes place, the boil can be frozen with ethyl chloride and the centre burned out with the Paquelin or electric-cautery tip. In some localities it is simpler and quicker to excise the boil, as advocated by J. Cropper.³

The difficulty comes, however, when the furuncles become multiple,

¹ Annals of Surgery, 1913, lvii, 561.

² Münch. med. Woch., May 30, 1911; review in Journal of American Medical Association, 1911, lviii, 175.

³ British Medical Journal, February 17, 1912; review in Journal American Medical Association, 1912, lviii, 818.

and the patient suffers from what has been called recurrent "crops" of boils. Schuele¹ is of the opinion that all general treatment with drugs or vaccines is fruitless, and that the infected skin should be washed daily with hot water and soap, disinfected with alcohol, and covered with a mercurial or zinc ointment. In my experience, the latter two drugs are unnecessary and interfere with the repeated hot-soap baths and alcohol disinfections. If each little area showing beginning infection is covered with a little yellow oxide of mercury ointment and protected with cotton and collodion, the other treatment is not interfered with, but often, in spite of all methods of treatment, the recurrence of the boils continues. However, the disease seems to be, to a certain extent, self-limiting. Mark Twain was of the opinion that starvation would cure a boil and reported a case to prove it.

Sulphuric Acid in Furunculosis. F. Twedell² writes interestingly of the internal medication with dilute sulphuric acid for pyorrhea alveolaris and furunculosis. He states that a result should be seen in from eight to ten days. The dose should begin with at least 30 minimis of dilute sulphuric acid three times a day in two or three ounces of water. This should be taken through a glass tube or quill, and the mouth immediately rinsed with an alkali. If there is no improvement in forty-eight hours, the dose should be increased. In one of Twedell's cases, 50 drops were given. In pyorrhea, however, the patient should not depend on this drug alone, but continue to have his dentist keep the teeth in good order.

CARBUNCLE. This infection, local in its beginning, should be looked upon as an expression of a lowered general resistance in the patient or an infection with an unusually virulent organism, such as anthrax and streptococcus. The local treatment is much more urgent than in a furuncle, especially if the general condition of the patient is handicapped by diabetes, chronic nephritis, or alcoholism. Recently I have been employing the electric cautery to burn out the centre of the carbuncle; previous to this, complete, radical excision was done. The former method seems to be as effectual, but the resultant wound is smaller and the period of healing shorter. Incisions into carbuncles are contra-indicated, but unfortunately often practiced in the beginning. This safer and more radical method has only one objection—the long duration of the healing of the granulating wound. Therefore one welcomes any method which is equally safe, but has not this disadvantage. S. Gucciardello³ claims that steam employed six to seven times daily is the most efficacious bloodless treatment. The extreme heat kills the pyogenic organism and, by hyperemia, increases the local resistance. Necrosis of the skin, with discharge of pus and necrotic material, take place rapidly.

¹ Centralbl. f. Chir., 1914, xli, 112.

² Medical Record, 1914, lxxxvi, 16.

³ Centralbl. f. Chir., 1914, xli, 35.

ACTINOMYCOSIS. Emil Sardemann¹ reports good results in four cases in which, in addition to less radical operation, the α -rays were employed. He calls attention to the contribution of Bevan,² in 1905. In this paper, Bevan advocated the α -rays and potassium iodide, apparently on the theory that iodine is liberated by the rays. As to the operative procedure, Bevan said: "The treatment which was first recommended—wide extirpation of the involved tissue as in carcinoma—is no longer regarded as necessary."

A few months later³ Bevan reported on the therapeutic value of copper salts in the treatment of actinomycosis. Since then I can find no literature advocating the use of copper or potassium iodide. Sardemann's is the first article recommending α -rays, and he is of the opinion that potassium iodide is unnecessary.

In a very recent paper by Hans Kolaczek⁴ we again find the statement that actinomycosis should be treated by extensive radical excision as in carcinoma. He says nothing about the α -rays or chemotherapy. This article concerns itself with actinomycosis of the lung.

Keppler,⁵ from Bier's clinic in Berlin, reports a case illustrating how this rather infrequent infection may be overlooked in the best surgical clinics. The patient, a male, aged forty-three, received a contusion to the left shoulder. He entered the clinic three weeks later with all the clinical signs of osteomyelitis of the upper end of the humerus, but so early that there were no definite α -ray changes. An exploratory incision was made finding some pus in the soft parts, but no gross changes in the periosteum of bone; the bone was not explored. The pus was not examined. The patient returned in about three months with evidence of bone changes in the α -rays and a suppurating wound, but the pus coming from the wound did not show actinomycosis. When the marrow cavity was opened at the second operation, the typical sulphur granules were seen and the microscope proved the presence of the organism. It was necessary, at a third operation, to amputate the arm at the shoulder-joint, and, at a fourth, to remove the clavicle and the scapula. The patient finally recovered—now almost four years since the last operation.

Nothing is said in this paper on the treatment with α -rays, potassium iodide, or copper salts.

In chronic infection, especially where the soft-part infiltration is out of proportion to the purulent area and, more especially, in the region of the jaw, we should constantly think of the possibility of this infection. When this disease is not deeply situated in the lung or abdomen, the prognosis seems good if the diagnosis is made at the first exploratory

¹ Beitr. z. klin. Chir., 1914, xc, 157.

² Annals of Surgery, 1905, xli, 641.

³ Journal American Medical Association, November 11, 1905.

⁴ Beitr. z. klin. Chir., 1914, xciii, 136.

⁵ Archiv f. klin. Chir., 1914, civ, 831.

operation before there has been spontaneous rupture and sinus formation, and at this early recognition the operation apparently should be radical. The cautery, electric or Paquelin, should be employed with the knife. The possibilities of auto-infection are probably greater than in any other infection.

In my experience, many cases apparently cured for two or three years may break out again, so I am of the opinion that we must not base conclusions as to methods of treatment unless the interval is three or more years. As long as a sinus persists we have in this an indication of the probable presence of an unhealed focus, and, on the other hand, the complete healing of all the sinuses does not exclude a buried latent focus.

Today we should bear in mind the less frequent forms of local infection, and there seems no question that the very bad results in actinomycosis are due to late intervention, or faulty diagnosis.

DIPHTHERIA. There are two recent monographs, one by Deutschaender¹ and the other by Zuellig.² Together they apparently cover the entire literature.

Deutschaender confines his definition of diphtheritic inflammation to cases in which not only is the bacillus of diphtheria present, but the local lesion has all the characteristics which may be defined as diphtheroid. Zuellig takes a broader conception and considers the inflammatory process to be diphtheritic providing the true bacillus of diphtheria is present.

Apparently this infection is unusual, but it is important that it be borne in mind, especially during an epidemic of diphtheria, as individuals with wounds may be carriers of the diphtheria, and their wounds, just as some throats, may show no positive evidence of the presence of the bacillus.

TETANUS. There has been no great improvement in the treatment of tetanus after the clinical picture has developed, and, in spite of the best treatment, the prognosis still rests more upon the space of time between the wound and the first symptom. The majority of authorities give the antitoxin both intramuscularly and by intraneural injection into the lumbar spine. There are still favorable reports from the employment of a solution of magnesium sulphate, as first advocated by Meltzer.³

The most common form of tetanus is post-traumatic, and here there is always an opportunity for effective preventive treatment which should never be neglected.

NON-TRAUMATIC TETANUS. The possibility of tetanus without a history of injury, or without demonstrable lesion of the skin or mucous membrane, is not widely appreciated. Perhaps, tetanus of the new-

¹ Deutsche Zeitschr. f. Chir., 1912, cxv, 310.

² Beitr. z. klin. Chir., 1913, lxxii, 531.

³ H. Stadler, Centralbl. f. Chir., 1914, xli, 807, 808.

born, in which the portal of entrance is through the umbilicus, and postpartum tetanus are best known, also, perhaps, the rare cases of tetanus after vaccination. But in this group one would not employ the preventive treatment, except when suggested by an epidemic.

Natonek's¹ collective review, therefore, is worthy of notice, as it suggests that we must be on the lookout for this complication when it may be least expected. He gives 310 references to the literature, and divides the cases into the following groups:

Tetanus after Injuries without Demonstrable Lesion of the Skin. Here there is contusion with subcutaneous fracture, a hematoma, or no gross demonstrable lesion after a contusion. Carefully investigated, the number of such cases is small, and, of course, in these it is difficult to absolutely exclude a slight abrasion as the portal of entrance. For example, in a most recently reported case the patient was struck with a lump of dirt thrown up by an explosion.

Animal experiments, and even clinical experience, demonstrate that the tetanus spore may remain dormant in the tissue for months or years, but if an injury or a pathological process gives rise to a focus of necrotic tissue, blood-clot, or foreign body near the spore, it germinates, the toxic serum is produced and tetanus develops. In animals, these spores can be injected into the muscle without result, but if injected into a hematoma, tetanus rapidly develops. The human body may harbor tetanus spores, and this may explain cases of this kind. Only five authentic cases are reported.

Scar tetanus is a term employed by Rose to include cases in which tetanus developed at long periods after healing of the wound. These cases usually recover. Rose cited these cases to prove his theory that there is a form of tetanus not due to the tetanus bacillus. This opinion is not upheld now. In such cases the tetanus spore was introduced into the wound without a foreign body and later, excited by some unknown cause, germinated and produced the disease. I have previously reported, in *PROGRESSIVE MEDICINE*, a few cases in which tetanus developed many years after an embedded bullet wound and where there had been a secondary contusion over the buried bullet.

There have been described some cases of tetanus after contusion of the head, neck, and spine, without a demonstrable lesion of the skin or any subcutaneous injury.

Rheumatic tetanus includes a group of cases in which there has been no history of injury and no demonstrable portal of entrance. These cases are also called *cryptogenic tetanus*. In many of these cases there is a history of contracting cold, or being exposed to wet, shortly before the attack. Some authorities have claimed that the tetanus bacillus got in through the tonsils or the mucous membrane of the respiratory tract, and the exposure to cold and wet lowered the resistance.

¹ Centralbl. f. d. Grenzgeb. d. Med. u. Chir., 1913, xvii, 196.

The mortality in this group is relatively small—51 cases, 16 deaths, 31 per cent. The average mortality of traumatic tetanus is variously stated to be between 70 and 80 per cent.

Tetanus through a Pathological Lesion of the Skin. Cases of tetanus are reported in which it has been demonstrated by laboratory methods that the portal of entrance has been through an acne infection, a furuncle, an ulcerating tumor, gangrenous tissue, or a wound left by a burn or frost-bite. We know that the tetanus bacillus in spore form is fairly widely distributed, especially in certain localities, and, theoretically, these lesions of the skin should present good media for the development of the spores. Here the tetanus bacillus is a secondary invader.

It is interesting to note that, in the cases of tetanus after a frost-bite, the period of incubation is longer than in any other group, a mean of thirteen days, and the mortality highest—87 per cent. Of course, in these cases we must figure the time of incubation as beginning at the time of the freezing. Also, in these cases, when the symptoms begin they are intense, and death as a rule takes place within four days. It is very encouraging to note that, in three of the four cured cases, the patients received, immediately after the first symptoms, large subcutaneous and intraneuronal doses of the antitoxin, while in only two of the fatal cases was the antitoxin given at all, and then late and in smaller doses. Then the cases of tetanus are grouped in which it is the opinion that the portal of entrance was through the respiratory tract, the tonsils, teeth, and alimentary tract. These are obscure cases and will not be reviewed here.

Natonek's review of *postoperative tetanus* is the best I have read. He has most carefully sifted all the evidence and has been unable to get at the exact etiological factors. Undoubtedly in the beginning, before our methods of sterilization of catgut were what they are now, there were some cases which could be proved to be due to catgut. The majority of cases of postoperative tetanus occur after laparotomies and gynecological operation, and they have not been influenced by anti-septic technique. It would appear as if these cases were due to auto-infection from the intestines. A number of English surgeons feel that this danger is eliminated when patients are properly prepared by restricted diet and catharsis. Yet, from this report, one would conclude that a number of cases of postoperative tetanus have occurred in spite of the usual modern surgical precautions. However, when we come to tetanus after injection of gelatin and other subcutaneous medications and after vaccination, the evidence suggests bad technique, or improper sterilization of the material injected, or defects in the manufacture of the vaccine.

We are encouraged here also with the possibility of treatment with the antitoxins. If it is given at once and in large repeated doses intermuscularly and intraneurally, the prospects for recovery are better than when this treatment is not followed.

This review suggests that we must not forget about tetanus. One never knows when a case will turn up, and treatment must be prompt and energetic. On my return to St. Agnes' Hospital after six weeks' vacation I found that there had been admitted the first case of tetanus since the hospital opened seven years ago. The period of incubation in this case was about twelve days. The patient recovered after the use of antitoxin, as noted above.

TUBERCULOSIS. From the stand-point of the surgeon I get the impression that the number of operations for surgical tuberculosis is growing less, but that this is due perhaps more to preventive measures than any other factor. It is also true that our cases of tuberculosis are coming to us earlier, and many recover without operative intervention.

In view of the education of the public as to the importance of early recognition and treatment of all forms of tuberculosis, the majority of surgeons are seeing lesions suggesting tuberculosis in such an early stage that all the ordinary clinical factors of diagnosis fail, and we must resort to laboratory methods. In many cases the excision of a piece of tissue for microscopic study or animal experiment is not feasible, and therefore we look to laboratory methods for help. There is a most interesting and complete monograph on the biological diagnosis of surgical tuberculosis by George Wolfsohn.¹ Space forbids its proper review.

I get the impression, from conversation with my colleagues and in consultations with them, that there is still room for great improvement in the biological diagnosis of tuberculosis in its earlier stages.

In the literature on treatment there are recent articles on the *x*-rays by Denks² and on the treatment of strictly surgical tuberculosis with *sun rays*³ at high elevations, also on the employment of *tuberculin* by H. Meyer⁴ and Carl O. Swenson.⁵

It is very difficult to judge of the efficacy of these methods of treatment when they are introduced early and associated with fresh air and other hygienic methods.

TUMORS.

Cancer Control. The formation of the American Society for the Control of Cancer took place in New York in May, 1913—sixteen months ago, and during this time there has been an active campaign of publicity. Never before has so much information on the subject of cancer been published in the public press, and it has had a definite influence

¹ *Zentralbl. f. d. Grenzgeb. d. Med. u. Chir.*, 1914, xviii, 236.

² *Beitr. z. klin. Chir.*, 1914, xcii, 842.

³ Alfred Huessy, *Beitr. z. klin. Chir.*, 1914, xci, 512; and Eugene Kisch and Hans Graetz, *Archiv f. klin. Chir.*, 1914, civ, 494.

⁴ *Beitr. z. klin. Chir.*, 1913, lxxxv, 28.

⁵ *Surgery, Gynecology, and Obstetrics*, 1913, xvii, 437.

for good in stimulating investigation and contributions to the problems of cancer in the medical press.

In March, 1913, I¹ delivered a paper before the Missouri Valley Medical Society and there summarized some of the factors which led to the formation of this national association. A number of years ago the Gynecological Section of the American Medical Association requested the House of Delegates to appoint a Committee to investigate the problem of educating the public on cancer of the uterus. Later, in some States, local committees were appointed, some of them taking up the larger problem of educating the public on cancer in general. Notable among these was the committee of the Pennsylvania State Medical Society under the chairmanship of Wainwright, of Scranton. A number of State Boards of Health had also issued pamphlets on cancer.

The way had been paved for this educational problem by the National Society for the Study and Prevention of Tuberculosis under the able direction of its Executive Secretary Farrand.

In the fall of 1912, the Clinical Congress of Surgeons appointed a Cancer Campaign Committee under the chairmanship of Cullen, of Baltimore.

It is my opinion that we owe to this Committee the publicity and stimulus which started the campaign on a national and even international scope. This Committee secured the coöperation of Samuel Hopkins Adams, whose writings in the propaganda against medical quackism had made him familiar with the medical profession and its problems. Mr. Adams first took considerable time and pains to get his facts in regard to cancer from the leading surgeons and pathologists throughout the country. His series of articles appeared in the *Ladies' Home Journal* for May, 1913, *Collier's National Weekly*, April 26, 1913, and *McClure's Magazine* for May, 1913. Later these articles were condensed in a chapter of a book written by Adams, and called the *Health Master*.

The impression made upon the public was remarkable. It demonstrated that the people were ready for the educational propaganda and that it was the duty and responsibility of the medical profession to continue it.

In the formation of the American Society for the Control of Cancer, financial help came chiefly from lay women and men, and undoubtedly Mrs. Mead, the daughter of Dr. Cleaveland, of New York, deserves the greatest credit for her enthusiastic and efficient campaigning for funds. In the last Bulletin of this Society,² Curtis E. Lakeman, the Executive Secretary, presents, in a very concise and clear manner, Cancer as a Public Health Problem. He first shows, from statistical data, the prevalence of cancer, the apparent increase of cancer, the menace of cancer to society, and the economic relations of life insurance to cancer.

¹ Medical Record, Kansas City, November, 1913.

² Monthly Bulletin of Department of Health of City of New York, April, 1914.

He then goes on to discuss the cause and control of cancer, and the methods that this American Society proposes to follow in educating the public. This Bulletin and other publications of the American Society for the Control of Cancer can be obtained by writing the Executive Secretary (Address: 289 Fourth Avenue, New York City).

PROPHYLAXIS OF CANCER. The importance of this subject is demonstrated by the fact that William J. Mayo,¹ the President of the American Surgical Association, chose this for the title of his presidential address at the last annual meeting in New York, April, 1914.

Mayo writes: "It is probable that the large majority of human beings possess an immunity to cancer; that a lesser number possess partial immunity, while a minority are without those protective agencies which render the local lesion effective."

This must be true, otherwise most of the human race would ultimately succumb to cancer, because congenital tumors, trauma, and chronic irritation are present in some spot in most of us.

In regard to the precancerous lesion, and on the clinical and microscopic diagnosis of malignancy, Mayo makes these statements:

"The clinician can say with a good deal of assurance that a certain lesion is benign, that another is malignant, but there still exist a number of mid-ground lesions of which he is unable to say that they are benign or malignant."

"The pathologist, by microscopic examination, can, in a much higher percentage of cases, definitely establish the benignity or malignancy of a growth, but there occur certain growths which even upon minute investigation he will be unable to diagnose positively as benign or malignant. Sections from such growths sent to different pathologists may bring back contradictory opinion, the majority being undecided."

This describes the problem and the dilemma in a nutshell. If we educate people to seek advice in the earliest stages, we will be less frequently able to make a positive clinical diagnosis, and even, in many cases, a positive microscopic diagnosis. Nevertheless, at the present time we have sufficient experience and know the best treatment, and the results in this stage when diagnosis is most difficult will be uniformly the best, in fact almost 100 per cent. As the clinical diagnosis becomes easier and the confirmation by the microscope more positive, the probabilities of a cure when the lesion is malignant grow less and less.

It is for this reason that all of us must be educated on those local lesions which may be called precancerous, so that we will seek advice immediately, because, in the majority of cases, these precancerous lesions in their onset excite no alarm either from discomfort, disfigurement, or loss of function.

¹ Annals of Surgery, 1914, lix, 805.

Mayo well classifies the precancerous lesions, or the local irritation into three great groups:

1. Congenital or acquired neoplasms, such as moles, warts, and benign tumors of various sorts, which may undergo malignancy.
2. Trauma, which has a close relation, especially with the development of sarcoma.
3. Chronic irritation, especially of the skin and mucous membrane, which gives rise to changes in the tissues which lead to epithelial activity and later to cancer.

Rodman,¹ of Philadelphia, in the Annual Oration of the Academy of Surgery of Philadelphia, delivered October 6, 1913, took for his subject Cancer and Precancerous Conditions. He quotes some remarkable statements from the last report of the Cancer Commission of Pennsylvania prepared by its Chairman, Wainwright. This Commission made a survey of 400 cases of cancer reported by surgeons throughout the State of Pennsylvania.

Sixty-eight per cent. of superficial carcinoma, and 48 per cent. of deep-seated carcinoma only were operable when first seen by the surgeon. In my experience, these figures correspond pretty closely with the statistics of large surgical clinics throughout the world. This simply means that the patient, through ignorance or fear, or because of bad advice of the physician seen first, delayed treatment. According to Wainwright, the average duration of the superficial lesion was eighteen months, of the deeper lesion fourteen months, and the average time between the consultation of the family physician and the date of operation was from thirteen months to one year.

In cancer everywhere Wainwright's figures show the relation of inoperability to delay, or, as he expresses it, "waiting to see what will develop." This shows that not only the people, but the profession also, must be educated.

The term "precancerous" is apparently not so new as many who employ it now think. Jonathan Hutchinson² employed it in 1889, and perhaps earlier. He writes: "That local inflammations often precede cancerous action is now a well-recognized pathological fact, and it is far better to operate in the precancerous stage than to wait until the disease is developed." This was written twenty-six years ago.

EDUCATION. Frederick L. Hoffman,³ statistician of the Prudential Life Insurance Company, and a member of the Executive Committee of the American Society for the Control of Cancer, has given the most valuable aid to the profession with his statistics on cancer. His address before the Clinical Congress of North America, Chicago, November

¹ Annals of Surgery, 1914, lix, 47.

² Archives of Surgery, London, 1889, i, 123.

³ Surgery, Gynecology, and Obstetrics, 1914, xviii, 726.

13, 1913, considers the educational value of cancer statistics to insurance companies, the public, and the medical profession.

The following table is taken from Hoffman:

Estimated Mortality from Cancer in the Continental United States:

	Both Sexes.	
	Death.	Per cent.
Buccal cavity	2,768	3.9
Stomach and liver	28,041	39.5
Peritoneum, intestines, rectum	9,371	13.2
Female organs of generation	10,790	15.2
Breast	6,886	9.7
Skin	2,627	3.7
Other organs and parts	10,507	14.8
	<hr/> 70,990	<hr/> 100.0

These figures give graphically the number of deaths from cancer in one year, and we also know that most of these deaths were preventable. The actual percentage does not, of course, give the relative frequency of cancer, because the more curable types of cancer will be represented in the mortality statistics among the lower percentage for example, the skin.

Mr. Hoffman has made many public addresses along this line and has written much, and I am confident that he will be rewarded for his energetic labors by observing throughout this country a new impetus in the careful search of the actual cancer conditions in different states, cities, and countries, so that in time we will actually know whether cancer is really increasing, and will be able to tell whether the propaganda of education resulting in the earlier diagnosis and treatment shows itself in a diminished death rate from cancer.

I am informed that Wisconsin and other States have already started such a survey.

The problem of bringing together all the agencies for investigating these statistics and all the agencies which may be helpful in the educational propaganda, will be a most difficult one. The American Society for the Control of Cancer, however, is trying to do this.

Frederick R. Green,¹ Secretary of the Council on Health and Public Education of the American Medical Association, tells us of the methods of education and publicity employed by his Committee. They have only recently taken up the problem of cancer. It is to be remembered that this council has developed certain methods and is financed by the medical profession. For this reason it is probably the most important agency to take charge of the problem of education in regard to cancer. This Committee, under the guidance of Dr. Green, stimulates the writing, and attends to the publication, of articles of educational value, and distributes these to the medical and lay press throughout

¹ *Surgery, Gynecology, and Obstetrics*, 1914, xviii, 611.

the country. In addition, they have organized a Speakers' Bureau, and during the year 1912-1913 properly qualified speakers were furnished for 350 meetings, who made addresses on various subjects in regard to public health.

Green summarizes the needs in regard to cancer into three groups:

The first thing is to interest the public, especially the wealthy and influential public, in the problem of control of cancer. This is a movement for public welfare, and there is no reason why the public should not assume part of the expense. This is the work for which the recently organized Society for the Control of Cancer is admirably adapted.

The second necessity is the careful investigation of the entire problem of cancer, its age, rate, and sex incidence, its relative frequency in different occupations and locations, and all the clinical facts connected with its appearance. There is today, in the records of our different hospitals throughout the country, an enormous mass of undigested material on this subject. This is clearly a clinical and surgical problem.

The third requirement is the distribution to the public of the results of such an investigation. This is obviously a task for the Council of Health and Public Instruction of the American Medical Association representing, as it does, the organized profession of the entire country. Through its machinery it can, without any additional expense, place before the public any information which may be desired on this question.

In this statement we have a clear differential of the three great factors working in this educational propaganda. All of us in the profession so situated that we can distribute facts of clinical and surgical value should do so at once. Let us get at this enormous mass of undigested material.

Frederick J. Taussig¹ writes tersely on this problem: "What are the best methods of educating American women concerning cancer?" Like Green, he is of the opinion that the American Medical Association alone cannot carry on this educational propaganda without the aid of such an Association as the American Society for the Control of Cancer. This latter Society offers an opportunity for members of the laity to become officers and members of the association and to help financially. The successful propagandas against tuberculosis, blindness, and infant mortality have shown the necessity not only of lay financial assistance, but of other assistance by the non-medical woman or man. The education, according to Taussig, must be carried by the written and spoken word, but in regard to cancer of the uterus most must be done through the spoken word. Taussig is averse to articles on the distasteful subject of cancer of the uterus appearing in the lay press. There is no question as to the tremendous force of the spoken word. We may reach hundreds and perhaps thousands this way, but in the same time we can not reach the same large number without the assistance of the written word. Cancer of the uterus is surely less distasteful than the

¹ *Surgery, Gynecology, and Obstetrics*, 1913, xvii, 610.

propaganda against social diseases, and I am confident that "What every woman should know about cancer of the uterus" can be written in such a way that it will not be distasteful, and yet lose none of its effectiveness.

Space and time forbid my reviewing other splendid contributions on the subject of cancer control and the educational propaganda, but from my own experience and writings and from the reading of this now voluminous literature, I have written a short article embodying what everybody should know about cancer, and it appears to me that it is not out of place to reprint it here.

All of the readers of PROGRESSIVE MEDICINE, if not now, will ultimately become interested, and perhaps helpers, in the control of cancer. The problem is now being taken up by City and State Boards of Health, by all the National Medical and Surgical Associations, and by the various State, County, and City Medical Societies. It is important that all of us should help, and that we should work along definite lines. Every physician should be a teacher with the spoken word to all of his patients and even to his friends who are not his patients in regard to the problems of public health, the chief of which are methods of prevention and early recognition.

What Everyone Should Know About Cancer. Public Address delivered under the Auspices of the Medical and Chirurgical Faculty of Maryland in Baltimore, March, 1914.

In the year 1913, in the registered areas of the United States, 70,000 persons died of cancer. As the unregistered area is large, the number of deaths annually must be much greater than 70,000.

In adults after the age of forty years, cancer is one of the most frequent causes of death. Now that tuberculosis has, to a certain extent, been controlled, some statisticians claim that cancer is the more frequent cause of death in persons over forty.

But we can safely say that if the public is educated in regard to the facts about cancer its annual mortality will be reduced at least one-half, perhaps two-thirds. We should educate ourselves to fear the beginning of cancer rather than wait for its late stages. In all forms of cancer fear of the disease comes too late. But fear at the first appearance of any suspicious sign will be of great value. This fear will induce patients to seek advice and treatment in that early stage in which the chances of a cure are best, even up to 100 per cent.

In cancer of the skin, lip, and tongue, and in the regions beneath the skin, such as in the breast, thyroid gland, and muscles, pain usually comes late, so if one waits for pain one often waits too long. This is an unfortunate state of affairs, for in the beginning there is no difference between the warnings of cancer and those of other diseases that are not cancer. We know to a certainty, however, what warnings may suggest the beginning. This is the opportune time for the examination which

will lead to diagnosis. This is the time for treatment which will promise the best results with the least danger.

Cancer never begins in a healthy spot. In external cancer the warning is always something that may be seen with the eye or felt with the finger. These first signs are warts, moles, little areas covered with a scab or unhealed wounds or sores, or there may be a little lump or nodule beneath the skin or deeper. Pain is rarely present.

Unfortunately, many people have frequently observed all of these things and they have either disappeared or remained unchanged for years. They remember these cases, but do not realize the great number of unfortunates in whom cancer has developed from such apparently innocent defects. It is not for the patient but for the physician to decide whether these visible and palpable abnormalities are to be left alone or removed. In this stage the removal of the defect always accomplishes a cure, and sometimes it can be healed without removal.

There is every reason to believe that cancer of the uterus should be placed among preventable diseases. There is always a discharge of a different character, at a different time and for a longer period than normal. Every woman should be educated never to conceal such symptoms, but immediately to seek the physician's advice.

In a woman over twenty-five, the finding of a lump in the breast should be considered a definite warning. If this lump is subjected to treatment at once, the chances are 50 per cent. that it is not cancer. In such a fortunate event it is only necessary to remove the lump. When the surgeon at his operation finds that the lump is cancer, the chances are still one out of four that it is the least malignant form of cancer, in which the probabilities of a cure are 100 per cent. If the lump proves to be of a more malignant form of cancer, the probabilities of a cure, at the worst, are still 85 per cent.

But when the woman delays, the chances of the lump becoming fatally malignant increase with each week's delay. The same operation for cancer in the late stages reduces the probability of a cure in the least malignant form of cancer from 100 to 64 per cent. and in the more malignant types from 85 to 33 per cent.

Unfortunately, women remember those lumps which have been present a long time and in which cancer has not developed. They also may know of lumps which have disappeared. What they should know and remember is that delay in seeking advice and treatment is gambling with death.

In cancer of the lip and tongue every man is similarly warned in time; there is always first to be seen and felt some abnormal defect. This defect is often a burn from smoking or an irritation from ragged teeth. When men heed this warning and receive treatment within a few weeks, the probabilities of a cure are 100 per cent. But any irritation of the little skin defect, or injury to the nodule beneath the skin, increases the

probability of the development of cancer, or, if cancer is already present, of its more rapid and fatal growth.

In cancer of the bones the early warnings are usually obscure, but if anyone receives an injury to a bone and the swelling and discomfort do not disappear in a few weeks, the physician's advice should be sought and an *x-ray* examination made. The experience of pain or discomfort in the region of any bone should be looked upon as a warning.

The problem of early recognition of internal cancer is a very difficult one, because there are few very definite signs. One, however, is always warned by a feeling of discomfort and some sensation never before experienced, and this is usually associated with what is called "indigestion." But such symptoms are so frequent in many individuals in whom no serious disease develops that the majority do not know that they may be the first warnings of internal cancer. The finding of blood in the secretions should be looked upon as a definite warning.

The recognition in their earliest stage of conditions that may lead to cancer, or of cancer itself, indicates a treatment which, in the majority of cases, accomplishes a permanent cure. In cancer of the skin, lip, and tongue, for example, the operation in this earliest stage should accomplish a cure in 100 per cent. of cases. The operation is a simple one; it can usually be performed under local anesthesia; there is no danger; there will be no mutilation.

The operation for cancer of the breast is neither serious nor dangerous, nor is the operation for cancer of the uterus. Few realize that operations for cancer of the stomach, colon, and the kidney are also by no means dangerous. The failure to cure is due to delay, not to surgery. People, however, cannot be treated unless they seek advice, and as a rule they do not seek advice in this earliest stage.

When you consult a physician, insist upon thorough examination first and not on treatment. There is no doubt that until recently the majority of persons, when ill, wished immediate relief and strenuously objected to any unusual preliminary examination. The briefer the examination, the better the impression the physician made. But if you wish protection from cancer or from any serious disease you must submit to a thorough examination before treatment.

The "snap" diagnosis, or a diagnosis made on a superficial examination, even if correct, simply means that the disease from which you suffer is in such a late and hopeless stage that its nature is written in capital letters on the surface of the body. It is in the beginning of most diseases that the diagnosis is most difficult and can be made only after a most painstaking examination, often only with the help of instruments of precision and laboratory investigation.

Remember that medicine which relieves pain does not, as a rule, have any effect upon the disease itself; it simply produces a period of freedom from discomfort and by so much delays the best time for treatment.

This is the secret of most quack medicines. This is also the secret of most drugs you get from a physician when you demand treatment without a thorough examination.

You will always be warned in time. Seek from those who know what these warnings are. The warnings of cancer do not differ from the warnings of diseases that are not cancer. These warnings must excite fear of the beginnings of cancer, so that you will seek immediate advice. The physician must do the rest.

Cancer is not an infectious disease. Again, it is not hereditary. And do not take "blood-medicines" to protect you from it, for it is not a blood-disease.

Cancer always begins in a single spot, and in that spot there is always first something that is not cancer. There is always an interval between the first warnings and the development of cancer. There is always an interval between the development of cancer and its spread from that spot. In a few instances the interval may be only a few weeks; in others, months; in many, years. No one can tell this interval. Delay, therefore, is gambling with death.

The cure of cancer at the present time is not to be found in a drug, nor in a serum, nor in a ray, nor in a miracle, but simply in the education of the people as to the signs of its beginning in purely local lesions and the importance of an immediate examination which will lead to recognition and treatment in the most favorable stage for a cure.

Investigation in the surgical-pathological laboratory of the Johns Hopkins Hospital and the University has demonstrated that the local propaganda of education has already had tremendous influence for good. The cases of early lesions of the skin, lip and tongue, in which the probability of a cure is 100 per cent., have increased in the last five years from 8 to 30, or more, per cent. The results in the operative treatment of fully developed cancer in these areas have also been tremendously improved. In cancer of the tongue—the most dangerous form of external cancer—the percentage of permanent cures has increased from 21 to 50 per cent.; in cancer of the breast, from 35 to 42 per cent. This improvement is due to earlier operations and not to better surgery.

EXPERIMENTAL. The literature on spontaneous tumors in animals and transplanted tumors, and investigations in regard to the etiology of the malignant disease and various serum and chemical tests for malignancy, is huge. Even if there were time and space for discussion, any presentation of the facts would be out of place in this practical review, unless there were results which could be employed in the diagnosis and treatment of cancer in the human being.

Bashford,¹ in his second Leyden paper, says that what is true of transplanted tumors in animals does not hold true for spontaneous tumors, but animal experiments on the relation of tumor formation and

¹ Deutsche med. Woch., 1913, xxxix, pp. 4 and 55.

tumor growth to chronic irritation confirm clinical observation and the relation between chronic irritation and cancer in the human being.

The Relation of Trauma to Malignant Tumors. I¹ discussed this very fully in 1908. Karl Hartmann,² from the surgical clinic of Steinthal in Stuttgart, in reporting two cases of sarcoma after trauma, rather agrees with Lubarsch that one should be very skeptical before concluding that a sarcoma was the actual result of the trauma. Nevertheless, in Germany the expert accident insurance physicians do accept the etiological relationship between trauma and some sarcomas, providing the four requirements of Thiem are fulfilled. These four requirements are as follows:

1. Proof of the trauma.
2. Trauma of moderate or severe degree.
3. The development of the tumor in the position of the trauma.
4. That the duration of the first appearance of the tumor shall not be less than three weeks nor more than two years after the trauma.

In their first case, the patient, a male, aged thirty-four, received a trauma on the shoulder on March 17; the tumor was observed about two months later. There was no question as to the trauma and the degree of the trauma, or that the position of the tumor occupied the area contused. In this case they were willing to concede the relationship between the trauma and the sarcoma.

In the second case all of the requirements were fulfilled, but, on account of the character of the local growth, they were unable to accept the trauma as the etiological factor. In this case there was an interval of six weeks between the contusion of the thigh and the palpable tumor. When the operation took place about ten weeks later, there was a bony and cartilaginous growth adherent to the shaft of the femur, the size of a man's two fists, which proved to be an osteochondrofibrosarcoma. They were of the opinion that it was impossible to conceive that this tumor should have developed within the brief space of ten weeks. They also recommended that the fourth requirement of Thiem should be modified in the sense that the character and size of the growth and the duration of time between the accident and the finding of the tumor should be within the limits of clinical experience.

I cannot agree with their conclusions in the second case. No one will deny that a fracture is the result of a trauma, and we often see, in the healing of badly united fractures, granulation tissue, calcified and ossified, of larger size than the tumor noted in this case, and in less time than ten weeks. The same is true of traumatic ossifying myositis. After the injury which produces the fracture or the myositis, the swelling is often palpable in less time than three weeks. The palpation

¹ PROGRESSIVE MEDICINE, December, 1908, p. 206.

² Beitr. z. klin. Chir., 1914, lxxviii, 572.

of the swelling after the injury is early or late according to the amount of intervening soft parts.

We have no absolute proof of the development of sarcoma after trauma, but we know that after trauma, if there is laceration, there must be an exudate filling the defect, then cellular granulation tissue, then scar tissue, and we know that the inflammatory process which fills the defect involves the surrounding tissues. We also know that there is no absolute rule as to the amount of such inflammatory reaction after traumas of different degrees in different tissues. As Adami well says, on one hand it may be insufficient, on the other hand excessive. We also know that there must be a controlling factor, because most wounds heal along definite lines, but we frequently see tissue formation far in excess of that in the usual course of events. Callous tumors after fracture, ossifying periostitis after contusion of bone, myositis ossificans after rupture of muscle, desmoid tumors of the abdominal walls from the trauma of pregnancy, keloids in scars, linitis plastica in cancer and ulcer of the stomach, huge inflammatory formations in the appendix and colon about slight ulcerations, huge hypertrophy of the tonsils and adenoid tissue in the nasopharynx from slight infection. In these cases no one will dispute the etiological factor. Why, therefore, not sarcoma? The sarcoma cell differs little from the embryonic cell of granulation tissue. Theoretically, it is easier to conceive of sarcoma developing from the granulation tissue secondary to trauma than from normal non-irritated connective tissue. Of course, many sarcomas develop from preexisting benign connective-tissue tumors, but in many sarcomas this is impossible to demonstrate.

I must confess that when it comes to the relation of sarcoma to trauma, I am willing to give the patient the benefit of the doubt, and, to repeat, I cannot agree with Hartmann's conclusion.

In the discussion on cancer which precedes this, I called attention to the universal acceptance of chronic irritation in the skin and mucous membrane as a factor in the development of carcinoma. Of course, the majority of people who receive contusions do not develop sarcoma, nor do all of those having an area of chronic irritation develop carcinoma. There are other factors—we may call them the presence or absence of immunity. But the more I observe my cases of sarcoma, the more I become convinced of the causal relationship of trauma to some types of sarcoma, both of bone and of soft parts.

Wilhelm Graef¹ is of the opinion that the question whether trauma can cause true tumor formation has not been proved experimentally, and the results of clinical observation are by no means uniform. For this reason trauma must be assigned as the cause of tumor only with great caution.

¹ *Surgery, Gynecology, and Obstetrics*, 1914, xviii, Abstract, 599.

LESIONS OF SPECIAL TISSUES.

Blood. In all surgical patients, a blood-examination is valuable as a routine procedure. Anemia lowers the resistance of the patient to shock. In some general conditions the coagulation time of the blood is longer than normal, and this makes operation dangerous. This is especially so in jaundice, hemophilia, scurvy, and purpura. Leukemia may come under surgical observation associated with local conditions, and the presence of this general disease in many cases is not known until the blood is examined. For example, obscure cases of gangrene, enlargement of the lymphatic glands, abdominal tumors, vague abdominal symptoms suggesting cancer of the stomach or colon, and some atypical cases of swelling of the gums often without hemorrhage. Then, again, the Wassermann test for the possible presence of syphilis should be made almost as a routine procedure.

Mumford¹ gives a summary under the title, *The Blood in Surgery*, in which he considers many of these conditions and blood-transfusion.

COAGULATION. The methods of estimating the coagulation time of the blood are by no means as certain as other blood-examinations, and, even if the coagulation time so estimated is longer, there is not always the expected hemorrhage after operation. In the majority of patients we have, as a rule, no great suggestion to influence us to make this examination. In one group of cases in which we have known longest the danger of hemorrhage—jaundice—the examination of the coagulation time has not always been satisfactory, and the methods of preventive treatment have not always been successful.

In cases of this kind, the surgeon needs the aid and coöperation of someone especially interested in the various new methods of blood-examination, because it requires considerable experience to be accurate in the coagulation-time investigation, and when blood-transfusion is indicated, but not urgent, the surgeon requires the assistance of such a specialist, in order to select the safer donor, that is, for the estimation of hemolysis.

Schloessmann² gives a review of the practical value of the determination of the coagulation time in surgical diseases. But even after reading this most recent article, I am still of the opinion that as yet the various methods are disappointing.

What the surgeon is usually confronted with, is unexpected hemorrhage on one hand, or thrombosis on the other. At the present time we are better prepared to treat hemorrhage. Our methods of recognizing the tendency to thrombosis before it has taken place are conspicuous by their inefficiency, and the same is true of the preventive treatment. On the other hand, our methods of treating hemorrhage, either inaccessible, or of a character beyond the control of artery clamp

¹ *Annals of Surgery*, 1910, li, 1.

² *Archiv f. klin. Chir.*, 1913, cii, 212.

or ligature, are good and still improving. From my reading and personal experience, I would place the greatest value on blood-transfusion; second, on the employment of blood-serum. The older methods of checking hemorrhages of this character are by no means as valuable, and some should not be employed, for example, the gelatin treatment and the local application of the older styptics. There is no harm in using calcium lactate in preventive measures, or for slight cases of hemorrhage. But, in all threatening hemorrhages uncontrollable by local surgical measures, no time should be lost in resorting to blood-transfusion or the blood-serum therapy.

The most numerous successful reports are in the treatment of the hemorrhages of the newborn, with or without signs of cerebral hemorrhage.

Coagulène Kocher-Fonio. This substance is a powder made from the blood-platelets of animals. The preparation was elaborated by Anton Fonio, in Kocher's clinic. George de Tarnowsky,¹ after his return from Kocher's clinic, describes the method, reports his personal experience with some twenty cases, and gives the literature. He speaks most favorably of it.

Kausch² has also tried it in some 300 operations during a period of six months. To check the oozing from a wound or bleeding surface, coagulène can be used in powder form or in solution, and Kausch, similar to Kocher, has tried it intravenously with no bad effects and apparently with specific benefit.

Anyone familiar with the history of the experimental work that has been done on the coagulation of blood and especially with the recent investigations of Prof. Howell, of the Johns Hopkins University, knows the great number of factors which enter into this physiological process, and that the problem is by no means settled. Kausch states that he has used coagulène in 300 operations during six months, but many surgeons would operate 300 or more times in six months and never be confronted with a dangerous hemorrhage requiring other than surgical means to check it, and before one can be convinced of the efficacy of any treatment one would like to know of the results tested by hemorrhages of a serious kind.

I have just found one of Fonio's original articles on coagulène.³ Fonio sought to get one of the elements which would aid coagulation by isolating one of the active substances from the blood-plates, and he obtained a powder which has been put upon the market, and, as I stated before, can be applied directly to a bleeding surface. This powder is still being tested in the surgical clinic of Kocher. Fonio does not report on the results of the intravenous application of the method.

¹ Surgery, Gynecology, and Obstetrics, 1914, xviii, 641.

² Centralbl. f. Chir., 1914, xli, 1189.

³ Surgery, Gynecology, and Obstetrics, 1913, xvii, Abstract, 421.

In addition to these serious and rarer forms of hemorrhage, surgeons often meet annoying *oozing in operations*, and if we could get a substance which would check this, it would be a very valuable addition to our armamentarium. In brain surgery, Cushing and others have used small pieces of *muscle* to check oozing, and, recently, A. Hilse¹ has employed *flaps from omentum*, fascia and striated muscle, but Hilse has seen some disadvantages here, so he experimented on animals for new methods, and finds *fatty tissue*, which can be gotten easier and in larger quantities, not only available but efficient. The fat should be freed of fascia. Bleeding ceases as a rule within a few minutes after the flaps are attached. He has had experience with two operations on human beings—both cases of hemorrhage from the liver in gall-bladder operations. He checked the hemorrhage in both cases with flaps from the omentum and subcutaneous fat tissue.

Schreiber² has employed 200 c.c. of 5 to 20 per cent. solution of *grape-sugar* as an intravenous infusion for internal hemorrhage with good results in gastric hemorrhages and those in typhoid fever.

Schattauer³ recommends a new substance called *styptase* to increase the coagulability of the blood, and Popielski⁴ recommends a substance called *vasoldilatin*.

Recent literature contains many articles on the coagulability of the blood in the treatment of hemorrhage and hemorrhagic diseases. From my personal experience and from reading this literature, I agree with T. B. Cooley,⁵ who reaches the following conclusions: Blood-therapy of some kind is the best remedy we have for hemorrhagic conditions. Blood-serum and, best, fresh human serum seem to have a specific action in hemophilia, while in purpura, melena and other toxic conditions, transfusion of whole blood seems best, and that transfusion is not a difficult procedure.

Nevertheless, a substance, such as *coagulène*, would be an additional help, especially in such types of hemorrhage as oozing from the wound in jaundice and in bleeding of an oozing character after the removal of the tonsils and nasopharyngeal operations.

The general practitioner, however, must remember that blood-serum and blood-transfusion are at the present time the methods of choice. Precious time should not be lost with the employment of the older styptics, or any of the newer preparations the efficacy of which has yet not been established.

LEUKOCYTOSIS. The total and differential count of the white cells as an aid in diagnosis is now well established and should never be neglected.

¹ Centralbl. f. Chir., 1913, xl, 1849.

² Surgery, Gynecology, and Obstetrics, 1913, xvii, Abstract, 421.

³ Ibid., 1914, xix, Abstract, 269.

⁴ Ibid., 1913, xvii, Abstract, 307.

⁵ Journal American Medical Association, 1913, lxi, 1277.

Eduard Lampé, Jr.,¹ in his monograph on this subject, gives credit to American writers Sadler, Cabot, Gries and Bloodgood² for placing this diagnostic laboratory method on a firm scientific and clinical basis.

He also gives in detail the conclusions of Sondern in regard to the diagnostic and prognostic significance of the total leukocytosis and the total neutrophile polynucleosis.

Sondern has made a number of communications which should be read in the originals.³ The conclusions of Sondern, as quoted by Lampé, are as follows:

"Slight increase in the relative number of neutrophile polynuclear cells points to slight infection, while a distinct increase indicates a severe infection."

"Slight neutrophile polynucleosis with slight leukocytosis points to a slight infection and fair resistance."

"Slight neutrophile polynucleosis with high leukocytosis shows slight infection with marked resistance."

"Distinct neutrophile polynucleosis and marked leukocytosis points to severe infection and good resistance."

"Distinct neutrophile polynucleosis and slight leukocytosis shows severe infection and poor resistance."

"Distinct neutrophile polynucleosis and no leukocytosis means severe infection and no resistance."

"An increasing neutrophile polynucleosis and decreasing leukocytosis points to increasing severity of the infection and diminishing resistance."

"A decreasing neutrophile polynucleosis with decreasing leukocytosis indicates improvement."

Lampé again quotes Sondern's conclusions as to the presence of pus and gangrene in the local lesion. Sondern's conclusions are based upon a large number of acutal differential and total counts in cases checked by autopsy or operation.

The differential estimation of the neutrophile polynuclear cells is of greater diagnostic value than the total count or the leukocytosis. In general, the following holds good:

"The greater the percentage of polynucleosis in relation to the leukocytosis, the greater is the probability of a purulent process."

Experience has shown that *in adults* with a polynucleosis of 70 per cent. there is no pus or gangrene, no matter what the leukocytosis; it is unusual with a polynucleosis of 80 per cent. and the probability of pus and gangrene grows with the percentage; 85 per cent. have never been observed without pus or gangrene; 90 per cent. always means a severe

¹ Beitr. z. klin. Chir., 1911, lxxiv, 230.

² PROGRESSIVE MEDICINE, December, 1901, p. 205; Annals of Surgery, Sept., 1901, p. 229.

³ New York Medical Journal, June 16, 1906.

degree of alteration; cases which showed 94.5 per cent. all ended with death, except one in which, notwithstanding a polynucleosis of 95.5 per cent., the life of the patient was saved by an operation.

With children, conditions are somewhat different. Normally, the child has a lower per cent. of polynuclear cells than the adult. Notwithstanding this, Sondern frequently observed a low polynucleosis in very feeble children with severe infection. He explains that "the vitality is so feeble that an absorption of toxins no longer takes place."

The controlling factor is absorption of toxins. Well encapsulated abscesses produce no high polynucleosis and leukocytosis; the same is true of bone inflammation and in processes on a tubercular or typhoid basis. This may lead to a condemnation of the method as unreliable, but in such instances the disproportion between the leukocytosis and polynucleosis furnishes a clue. The highest percental values of polymorphonuclear cells and the highest absolute leukocytosis are seen in cases in which bacteriological examination has demonstrated the presence of staphylococci and streptococci.

One interested in this question of total and differential leukocyte counts should read Lampé's article in the original, and also a second one by Guido Lerda and Giacinto G. Rossi.¹

Bloodvessels. It is interesting to observe the development of modern surgery of the bloodvessels from my surgical index. First, there were the articles on experimental surgery, then a few reports of clinical cases applying the methods established in the experimental laboratory, and now the clinical papers are greater in number than the experimental.

INJURIES. Fritz Lotsch's² contribution to fire-arm injuries of blood-vessels makes interesting reading at the present moment. His experience came during the first Balkan war, and he aptly says that war surgery no more than peace surgery can be learned from books. His conclusions in regard to his observations are as follows:

1. The modern pointed projectile frequently causes vessel injuries.
2. Aside from immediately fatal hemorrhages, owing to the smallness of the openings made, profuse primary hemorrhages which require immediate operative intervention are relatively rare.
3. All grades of vessel injuries, from glancing to perforating, are observed.
4. Frequently artery and vein are injured together.
5. In most cases there is formation of a "silent hematoma," which eventually begins to pulsate in a few days and becomes a spurious aneurysm.
6. All severe injuries near large vessels, even without any hematoma, are urgently suspicious of thrombosis and should be carefully fixed on account of the danger of embolism.

¹ Archiv f. klin. Chir., 1911, xvi, 897.

² Beitr. z. klin. Chir., 1914, xci, 175.

7. Well fixed "silent hematomas" may, with good means of transportation, be unhesitatingly transferred to the field lazarettos. The danger of hemorrhage should be noted on the wound tablets.

8. Only in threatening rupture, when there is danger of pressure gangrene, and in suppuration should primary ligation be done. In proper fixation and eventual compression, many fire-arm injuries of the vessels will heal without operation.

9. Under the still primitive conditions of field and main dressing stations, ligation of vessels is difficult and time-consuming. Unnecessary ligations should therefore be avoided at dressing stations and be left to rear formations.

10. Hemorrhages demand, in every case, immediate intervention in narcosis and under Esmarch.

11. In every instance, double ligation on each side of the injury should be attempted. Under unfavorable circumstances this requirement is impossible even for the experienced. Ligation at the place of choice must take its place.

12. The technique of ligation of vessels has gained much in practical importance for war surgery. More than ever ligation of even the smaller vessels should be practiced on the cadaver in operative courses.

13. In about four to nine days, at least on the extremities, sufficient development of collateral circulation may be relied upon.

14. Aneurysms should at first be treated by compression. But the above-mentioned indications may compel intervention at any time.

15. If possible, operations for aneurysms should be left to the stationary lazarettos. Here operation may be done under the same environment as in peace, and the excision of the aneurysmal sac done after ligation of the afferent and efferent vessels.

16. Vessel suture is only indispensable in a disappearingly small number of the cases. When possible it should be done with every effort under the best possible conditions. Primary suture of vessels is impossible in dressing stations.

W. W. Grant¹ discusses the treatment of bloodvessel injuries from the stand-point of the civil surgeon and quotes chiefly from Stevenson, Bernheim, Lejars and Lexer, but he records no actual cases, demonstrating the truth of Lotsch's statement that in civil practice these injuries are rare. It is in the surgery of tumors and aneurysms that the civil surgeon must get his chief experience with the technique of blood-vessel suture.

J. Garland Sherrill,² however, reports an actual case associated with a dislocation at the elbow of the backward type. There was absence of pulsation of the radial artery, swelling of the forearm and purple discoloration of the skin. At the elbow, no signs of a false aneurysm could

¹ *Surgery, Gynecology, and Obstetrics*, 1914, xviii, 532.

² *Annals of Surgery*, 1913, lviii, 534.

be made out. The first treatment in this case was to immerse the arm in hot water. He waited three hours without seeing any improvement in the circulation. (I would venture to suggest in this case that it would have been better to at once reduce the dislocation under primary gas anesthesia. This return to normal anatomical relations would have been best for collateral circulation and, if the brachial artery had not been torn but simply occluded by pressure, the circulation would have been restored to normal.) An incision was then made, the dislocation reduced, the torn brachial artery exposed. The clot was removed, the two ends were prepared and sutured by the method of Carrel. After the operation, although the radial pulse could not be felt, the circulation was restored almost to normal. Later this radial pulse was made out positively.

Of course, it is unusual for gangrene of the arm to follow rupture of the brachial artery. Nevertheless, this was the proper thing to do. When the popliteal artery is similarly ruptured, gangrene is usually the rule. Here the importance of immediate exposure of the vessel and end-to-end suture is greater than anywhere else.

VESSEL SUTURE. The various accessories to simplify arteriovenous anastomosis for blood-transfusion are a definite indication that many surgeons question their ability to perform direct arterial or arterio-venous suture without some assistance beyond the established technique of Carrel. Naturally, we would therefore expect similar adjuncts for assistance when the arterial suture must be permanent. J. Shelton Horsley,¹ who has had large experience with experimental work, has devised what appears to be a most helpful adjunct. This instrument and its method of application to the Carrel triangular end-to-end suture are illustrated in Figs. 43, 44, 45, 46, 47, 48, and 49. Horsley also uses a mattress suture which turns *out* a flange not only approximates the intima more accurately, but leaves almost no thread exposed in the lumen. According to Horsley, this is an improvement over the regular overhand stitch. Figs. 50 and 51 show the stitch and line of union when the overhand stitch is employed (Fig. 52) when Horsley's method is used.

Horsley does not employ salt solution to wash out the ends of the vessels—he thinks this adds to the trauma to the endothelium. He shows many photographs of successful end-to-end sutures in animals.

Pignatti,² an Italian surgeon, gives his experience with the healing of wounds of arteries and the experimental production of traumatic aneurysm. First, there is a very interesting review of the histological study of the scar, and he states that the experimental production of traumatic aneurysm is difficult, but he has been able to produce both the true and false aneurysm.

¹ Annals of Surgery, 1913, lviii, p. 536.

² Surgery, Gynecology, and Obstetrics, 1913, xvi, Abstract, 531.

Leitao de Cunha¹ reports on a mechanical device to aid in the end-to-end anastomosis of arteries and veins. It is his opinion that the great difficulty in the Carrel method lies in separating the arterial wall and in arranging the buttonhole for the arteries into a true triangle. His apparatus is devised to accomplish this.

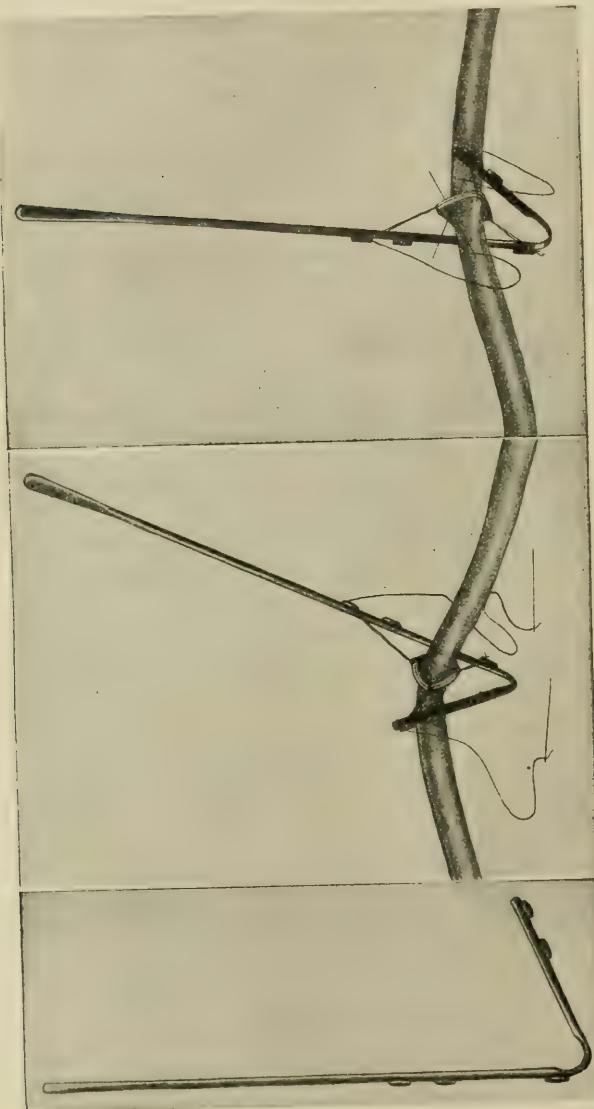


FIG. 45

FIG. 44

FIG. 43

Fig. 43.—The arterial suture staff. The threaded ends from the last two sutures are left long for further suturing. The circumference of the vessel is made triangular and the intima is everted by the tension of the suture staff.

Fig. 44.—The three guy sutures have been placed and fastened to the buttonholes on the staff. The handle of the staff is upright and the whole instrument is lifted up somewhat to increase the continuous double mattress, or cobbler's stitch, has been started using the threaded ends from the last two guy sutures. The needles are thrust through the margins of the artery near the insertion of the second guy suture. The needles should be inserted at about right angles to each other so they can be handled better. The suturing in this third is done toward the operator, that is, from the second to the third guy suture.

Jeger and Unger² report and illustrate a method first devised by Lespinasse, Fisher and Eisnstaedt. This method somewhat resembles

¹ *Surgery, Gynecology, and Obstetrics*, p. 532.² *Archiv f. klin. Chir.*, 1913, cii, 305.

the prothesis method of Payr. They employ a thin absorbable magnesium ring perforated with eight holes (Fig. 53). But their procedure of fixing the arterial cuff to the ring is somewhat different, as they employ eight sutures (Fig. 54) instead of four sutures as shown in Fig. 55,



FIG. 46.—The handle of the staff is depressed until it is horizontal and points away from the operator. The whole instrument is shoved toward the operator so as to increase the eversion of the intima in the second third. The suturing is continued as a cobbler's stitch.

FIG. 47.—The handle of the staff is then brought over to a horizontal position pointing toward the operator. The instrument is lifted up so as to increase the eversion of the last third. The suturing is continued toward the second guy suture.

and again in bringing the rings together and thus snugly approximating intima to intima, they employ the single suture (Fig. 54) rather than the mattress suture as used in the original method (Fig. 55).

The contribution of Dobrowolskaja¹ on the technique of end-to-side

¹ Beitr. z. klin. Chir., 1914, lxxxix, 428.

vessel anastomosis, has too many illustrations for reproduction, but it is a pure suture method without any mechanical aid, and the article should be read in the original.

Apparently the suture of bloodvessels is passing through the same stage of development as intestinal suture, but as surgeons became more experienced with intestinal suture they began to give up all mechanical aids, preferring direct suture. The same will probably be true of vessel suture. Carrel's experimental results are so perfect that when they are correctly applied to the surgery of human vessels the result should be the same, but surgeons less experienced in his technique should



FIG. 48.—The handle of the instrument is brought to a vertical position and the threads tied. The distal serrefine is slightly relaxed while the short shaft is pressed toward the long shaft so relaxing the tension of the spring. If any markedly spouting point is seen, an extra suture can be inserted.

arm themselves with the simpler forms of these mechanical aids so that when they are confronted with this emergency they may proceed with greater confidence.

I have by no means covered the recent literature, but have attempted to discuss that which seemed to be most useful and practical.

ANEURYSMS. Carl Stoltz,¹ from the surgical clinic of Henle, in Dortmund, attempts to bring the indications for the choice of operation in aneurysms up to date, reporting, in all, nine cases operated on by Henle. He favors the double ligation of the artery, with excision of the sac if the collateral circulation will allow this. He calls attention to three

¹ Beitr. z. klin. Chir., 1914, lxxxviii, 452.

recent collective reviews in which chiefly the so-called more modern methods are discussed: Vessel suture with or without transplantation of vein (autoplastic). He disagrees with one of the reviewers who concludes that double ligation and excision of the sac is an antiquated method. Stoltz apparently makes his point good. Among the nine cases reported by him from Henle's clinic, in eight the aneurysm was traumatic, due to bullet wounds. In these cases the examination before,

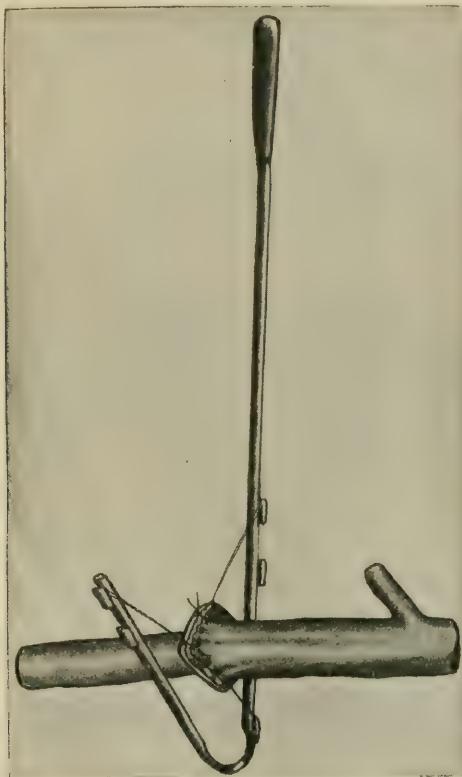


FIG. 49.—Showing the method of suturing applied to transfusion of blood on the right vein, which is somewhat larger than the artery. The vein has a branch through which a smooth probe covered with vaseline can be inserted and carried up into the artery if obstruction occurs. By pressing on the main trunk of the vein clots are blown out through the branch.

or during, the operation demonstrated good collateral circulation. For this reason the method of double ligation and excision was employed. In one case the aneurysm was non-traumatic, due to syphilitic arteritis. The good collateral circulation in the larger group is attributed by Stoltz to the supposition that the false sac is situated to one side of the injured artery and as it enlarges it gradually obstructs the lumen of the main artery and thus gives time for the collateral circulation to develop,

while in the non-traumatic type the gradual dilatation of the artery does not interfere sufficiently with the circulation in the main trunk to develop collateral circulation. In this case, Henle was forced to transplant a vein, and the operation was partially successful.

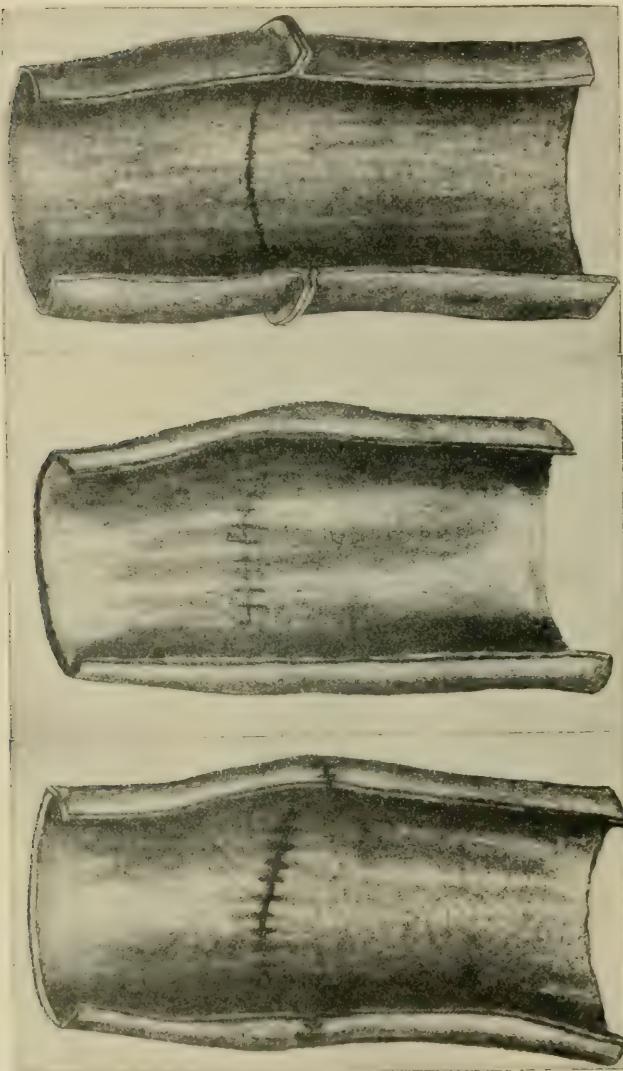


FIG. 50

FIG. 50.—This drawing, reproduced from Guthrie, shows the appearance of the lumen of a bloodvessel immediately after it is sutured by the method of Carrel. Note the large amount of thread exposed in the lumen. FIG. 51.—This drawing, also from Guthrie, shows the appearance of the lumen of a bloodvessel several weeks after successful suturing. The stitches have been covered by endothelium which is still partly transparent. The older the specimen, the thicker and more opaque becomes the covering over the sutures until the stitches are completely hidden from view. This is true of any method of suturing whether the mattress or overhand stitch is used. It is the first day or two after the suturing before the stitches are covered over that the amount of thread in the lumen is important. Sutures seem to work away from endothelial surfaces toward the lumen in case of the intestine and toward the surface in the case of bloodvessels.

FIG. 52.—This drawing shows the eversion of the intima caused by the double mattress stitch and the consequent absence of any raw surface left in the lumen of the vessel. Note the very small amount of thread left exposed to the blood current as compared with Fig. 50. Note also the strong grip that the loop of the mattress stitch has on the tissue.

FIG. 52

FIG. 52.—This drawing shows the appearance of the lumen of a bloodvessel which is still partly transparent. The older the specimen, the thicker and more opaque becomes the covering over the sutures until the stitches are completely hidden from view. This is true of any method of suturing whether the mattress or overhand stitch is used. It is the first day or two after the suturing before the stitches are covered over that the amount of thread in the lumen is important. Sutures seem to work away from endothelial surfaces toward the lumen in case of the intestine and toward the surface in the case of bloodvessels.

Stoltz then considers the cases of aneurysm reported in the literature in which vein transplantation was employed rather than double ligature and excision. In some of the cases he is of the opinion that the operation was unnecessary because of the situation of the aneurysm on a smaller artery like the brachial, in which the older method is always successful,

and then again when it has been employed for aneurysms such as of the popliteal, one cannot be certain that the transplanted vein has restored the circulation in the main artery and has not become thrombosed,

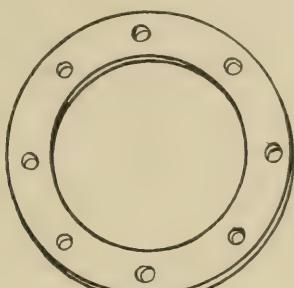


FIG. 53

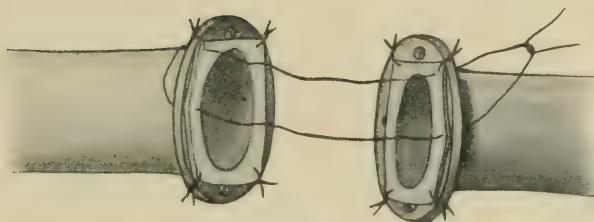


FIG. 54

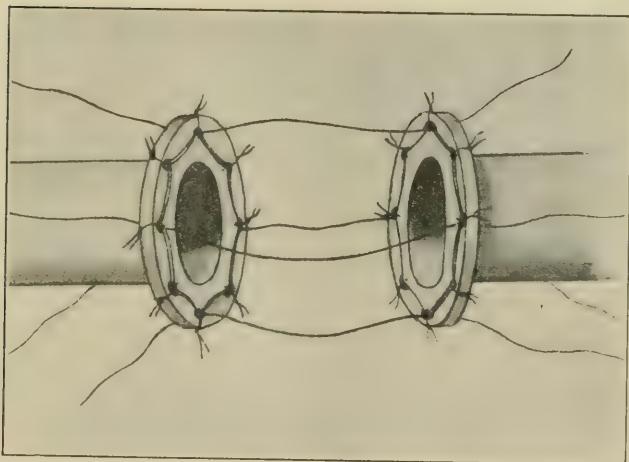


FIG. 55

because there is no absolute proof that sufficient collateral circulation had not developed. From his study of the literature, he is of the opinion that there have been two really successful cases in which we can be quite

certain that the result could not have been obtained by any other method; one by Lexer, and one by Henle.

I have not now the opportunity to go over the literature and check the statements of Stoltz, but this presentation of the subject should be carefully borne in mind when one is considering the choice of operation.

Stoltz also mentions Henle's test for collateral circulation. The artery above and below the aneurysm is exposed and temporarily clamped; now, if the Esmarch—if it has been employed—is removed, one carefully watches the return of circulation in the limb below. But a more certain procedure is to divide the distal artery and then remove the clamp: if bleeding takes place from this end there must be collateral circulation, and one can proceed with double ligation and removal of the sac. If it does not, then one must attempt some method of vein autotransplantation.

Stoltz does not discuss whether, in some cases, the removal of the sac may not of itself interfere with collateral circulation, and thus jeopardize the result. Matas, to whose splendid contributions he does not make any reference, mentions this as a contra-indication to incision and as evidence in favor of his reconstruction operation. Nor does Stoltz discuss Halsted's method of partial occlusion of the artery which has for its object the development of collateral circulation.

Of course, if collateral circulation is well established, the surgery of aneurysms is a comparatively simple procedure. But when it is not, the problems become much more difficult, and, as it appears to me, are not yet definitely settled. I agree with Stoltz, however, that the older method—ligation and double ligation with excision of the sac—still holds its place in the surgery of aneurysm.

The probabilities are that the traumatic aneurysm is a simpler problem than the non-traumatic.

In previous numbers of PROGRESSIVE MEDICINE I have covered the literature pretty systematically, but this recent review of Stoltz seems to demonstrate that the more recent improvements in arterial suture and vessel transplantation have not as yet reached that stage of perfection hoped for when applied to the treatment of the more difficult aneurysms.

ARTERIAL ANEURYSMS IN WAR. Otto R. von Frisch¹ contributes the results of his experience in 16 cases of arterial aneurysm among 900 injured in the Balkan war during the months of November and December, 1912.

In the first place, in all but 2 of these 16 cases, the bullet tract after the first dressing had remained clean. Von Frisch is of the opinion that if suppuration of this tract takes place the patients must die of hemorrhage before they reach the receiving hospital. In 2 of his cases the wound was infected, but, in 1, the infected portion of the tract

¹ Beitr. z. klin. Chir., 1914, xci, 186.

did not reach the aneurysmal area; in the second, the aneurysm did not develop until after the incision of the phlegmon. Only 2 cases were associated with fracture—1 of the tibia and 1 of the fibula; only 1 case with nerve injury (musculospiral); in 6 cases some part of the femoral artery was involved; in 5, the posterior tibial; in 1, the anterior tibial, leaving 4 of the upper extremity, 1 each for subclavian, axillary, brachial and ulnar. This wide distribution is interesting, because it shows that von Frisch's method is applicable to all.

He deals with arterial aneurysms only as there were no arteriovenous aneurysms among his group of cases.

This shows that efficient first aid will prevent infection in the majority of cases and give these men with injured vessels an opportunity for proper treatment.

Von Frisch warns that the diagnosis is difficult. One must never wait for pulsation. In any swelling of the extremities after a bullet wound, the palpable hematomatous swelling may be the result of an injury to a large bloodvessel. These cases, in addition to the protection of the wound, should be properly fixed to insure absolute rest, even if there is no fracture, and transported carefully to the nearest general hospital. The only indications for immediate operation, nearer the firing line at the first station, are hemorrhage and infection. The method of this operation is the same, as I will discuss later.

One becomes suspicious that the swelling is an aneurysm when it does not subside after a few days, or when it grows larger. Pain is always more marked in the hematoma of the aneurysm type.

The time to operate is between the third and the fifth week after the injury, if the urgent indication, hemorrhage or infection, is absent. The delay of three weeks allows collateral circulation to develop; after the fifth week the operation is more difficult technically, due to the development of the sac, connective-tissue changes, and organization of the hemorrhage.

The method of operation employed by von Frisch in all of his cases consisted in exposure of the hematoma, turning out of the blood-clots, finding the injured artery and doubly ligating it.

If possible this operation should be done under the Esmarch bandage. If not possible, the artery above and below the aneurysm is exposed and temporarily clamped. If there is any question as to the sufficiency of the collateral circulation, the test just described by Stoltz is employed.

Von Frisch, in his fifteen operations by this—one of the oldest—method was successful, and his evidence confirms the statements of Stoltz who, however, operated at a later stage and ligated the artery outside the sac instead of within the hematoma before the formation of the sac.

Von Frisch was prepared for vessel suture or transplantation, if necessary, but found no occasion to do it.

These two articles of Stoltz and von Frisch, it appears to me, place the diagnosis and treatment of traumatic arterial aneurysms on a solid foundation. Undoubtedly, the operation will be simpler if it can be performed between the third and fifth week. Here we have evidence of the importance of properly equipped hospitals where major operations can be performed in time of war near the active army.

ARTERIOVENOUS ANEURYSMS IN WAR. V. Subbotitch's¹ experience with traumatic aneurysms, also in the Balkan wars, is somewhat different from that of von Frisch. For example, after the ligation of the femoral artery in 4 cases, the popliteal in 1 case, and the posterior tibial in 2 cases, there was gangrene of the foot. In these 7 cases the hematoma was not evacuated. This should be compared with the excellent results in the cases operated on by von Frisch, in which the hematoma was evacuated and the vessels ligated at the point of injury.

Subbotitch's report considers 105 cases operated upon 135 times by twenty-four surgeons. He reports not only upon arterial, but also upon arterio-venous aneurysms, and upon suture of bloodvessels. Among these cases there were only 46 sutures—30 of arteries and 16 of veins; of these, 25 were but partial sutures—15 arteries and 11 veins. There were, therefore, but 20 circular sutures—15 arteries and 5 veins.

Subbotitch cautions against attempting to locate the position of the arterio-venous opening by the thrill made out on auscultation, as this as a rule would direct the surgeon to a more central point. The best method to locate the communication between the artery and vein is to draw an imaginary line between the orifice of entrance and that of exit. Although Subbotitch does not mention it, the *x*-rays would show the position of the bullet if there is no orifice of exit.

He disagrees with von Frisch and Stoltz and prefers to operate without the Esmarch. It can be placed loosely in position for an emergency if the surgeon so desires. But we note that many of these operations were ligations of the artery above the hematoma with, perhaps, in some cases later evacuation of the sac which he also recommends. In such instances an Esmarch is not so necessary, but there were a number of direct attacks, because there were forty-six sutures. His objections to the Esmarch are as follows: The oozing after it is obviated; the awkwardness of temporarily loosening the Esmarch to investigate collateral circulation and bleeding from the distal vessel. He also thinks that the dissection is easier without the Esmarch and venous hemorrhage less. Nevertheless, he cautions against sudden hemorrhage in passing through the blood-clot, but says that although you may not see the bleeding-point, you can quickly feel the opening in the artery with the finger. My experience with aneurysms of this type is too small, but I must agree with von Frisch that operation with the Esmarch is safer, especially in military hospitals when the operative surgeon is less apt to have a good team assisting him.

¹ Deutsche Zeitschr. f. Chir., 1914, cxxvii, 446.

Subbotitch cautions against vessel suture unless it must be done to save the limb. It is chiefly indicated in arterio-venous aneurysm. The dangers of suture are: secondary thrombosis with embolism, and secondary hemorrhage, and that in spite of the best technique. We must know, of course, that the conditions here are not the same as in the experimental laboratory. Subbotitch also cautions against too early intervention, because for vessel suture the artery or vein is not in as good a condition as it will be later—the vessel wall is more friable and the endothelium has not been replaced. So early operations mean a sacrifice of more of the vessel, and this, of course, adds to the difficulty of end-to-end anastomosis. The best time, according to Subbotitch, is between the second and third week; later intervention is contraindicated by scar-tissue. It is interesting to note that transplantation of vein was not indicated in any of his cases.

These three articles present in a most satisfactory way what recent experience in the Balkan wars has added to the operative treatment of traumatic aneurysm.

SUCCESSFUL OPERATION FOR EMBOLISM OF THE FEMORAL ARTERY. Key¹ reports the following case: The patient, a male, aged forty-three years, with a cardiac lesion of the mitrostenotic type, was suddenly taken with pain in the abdomen, bloody diarrhea and vomiting; in spite of the probable diagnosis of thrombosis of the mesenteric vessels, he recovered. Twenty days later he experienced sudden pain in the left popliteal space, coldness and anesthesia of the leg. Operation in seven hours; incision over the popliteal artery exhibited no pulsation; then an incision was made over the femoral artery at the position of the deep femoral branch. Just above this bifurcation a resistant body was felt in the artery. The vessels were temporarily clamped, the artery incised and the embolus removed, the opening being sutured. During the operation there was some troublesome hemorrhage from the external pubic artery. The patient recovered without gangrene. Key finds three operative cases in the literature: one successful, two failures.

I have reported a successful case.² Here, by massage, I moved the embolus down from its position in the femoral artery at Poupart's ligament, gradually breaking it up. I saw this patient five years later in perfect health and with no residual symptoms. At that time I mentioned two specimens in the Surgical Pathological Laboratory of the Johns Hopkins Hospital of an embolus plugging the popliteal artery, and I have had a third specimen since then.

In these cases the symptoms were sufficient to make an early diagnosis and to justify an operation before gangrene had set in. Two of these cases were postoperative, and for this reason should have been recognized and operated on.

¹ *Surgery, Gynecology, and Obstetrics*, 1913, xvii, Abstract, 183.

² *PROGRESSIVE MEDICINE*, December, 1908, 160.

SUCCESSFUL VENOUS TRANSPLANT AFTER RESECTION OF ANEURYSM. Lexer¹ was the first, in 1907, to employ a venous transplant after resection of an aneurysm. This first case was not successful. His second case in 1912, however, was successful—12 to 14 cm. of the femoral and popliteal arteries were resected for aneurysm, and a transplant taken from the internal saphenous. He now reports a third case. The defect—16 cm.—extended from the external iliac to the femoral below the profunda branch. The aneurysm was non-traumatic in a male, aged sixty-two years. The symptoms had been present two months. There are a number of points in this case of especial interest. In the first place, an Esmarch could not be employed; then Henle's test for collateral circulation indicated its absence; when the clamp was removed from the femoral below the profunda there was no bleeding; restoration, therefore, of the continuity of this artery was necessary for the life of the limb. The saphenous vein was taken from the same limb because it was exposed during the dissection; its caliber was much smaller than that of the artery.

Lexer employs two, instead of three, tension sutures. This allowed stretching of the vein up to the caliber of the artery. The friability of the artery prevented the usual continuous suture. For this reason Lexer employed mattress sutures, and after they were all tied and the clamps removed, no bleeding took place and pulsation returned to the lower artery. Tests made since then seem to prove without the shadow of a doubt that the life of this limb is maintained by the circulation through the transplant. It also demonstrates that it is not absolutely essential to have a vein of the same caliber, and that the Carrel three-tension-suture method is not essential; that the interrupted mattress suture is as available and satisfactory as the continuous. Henle's suggestion, therefore, to split two smaller veins and suture them together longitudinally in order to get a larger vein, is unnecessary. It was ten months since the operation when Lexer reported this case before the German Surgical Congress in 1913. The only complication was thrombosis of the remaining saphenous vein below the ligature. For this reason, Lexer thinks it might be safer in the future to take the vein from the other leg.

These little points in technique should be borne in mind when similar difficulties are encountered. The late results in these successful cases will be watched with great interest.

Coenen, in the discussion of Lexer's paper, also reports a successful case in which the test of suture was even greater, because both the femoral artery and vein were resected, and pieces of the saphenous vein from the other limb were sutured into the two defects. The aneurysm was arterio-venous, secondary to a bullet wound. Tests at the opera-

¹ Centralbl. f. Chir., 1913 xl, Supl. 26.

tion showed that there was no collateral circulation. This operation was done in February, 1913.

I have no new literature for discussion on Matas' method nor on wiring.

LIGATION OF LARGE ARTERIES. F. Strauss¹ again discusses the question as to the relative frequency of gangrene after the simple ligation of the common iliac or external iliac artery. He first refers to Halsted's² paper which I have reviewed in PROGRESSIVE MEDICINE³ as the most important and comprehensive in recent literature, but Strauss cannot agree with Halsted who supports Kuemmel's view that it is less dangerous to ligate the common iliac artery than the external. Halsted's opinion is that when gangrene has followed the ligation of the common iliac, it has been due to either the beginning of gangrene before the ligation, or to some complication during or after the ligation. Strauss however, from a comparison of the cases after a septic operation, reported in recent literature, takes the opposite view.

He also calls attention to the importance of Korotkow's test for collateral circulation, a test mentioned also by Subbotitch.⁴ The artery is compressed above the aneurysm, and the blood-pressure taken in the toes or fingers. Here we have, therefore, an indication, or contra-indication of ligation. Then the artery is compressed above and below the aneurysm, and the test again applied to the fingers or toes, and now we have an indication of whether resection can be done or not.

I have recently ligated the external iliac artery because of bleeding from a huge sarcoma of the thigh extending into the pelvis. The hemorrhage was checked, but the circulation of the limb finally restored itself, although there was a period of forty-eight hours in which it looked doubtful, and during this time the temperature was maintained artificially.

Gangrene.—FROST-BITES. The recent paper of Arthur W. Meyer and R. Kohlschuetter⁵ is of more than usual interest. The literature on this type of gangrene, especially in recent years, is scanty. The great improvement in the conditions of life throughout the world has made this type of wound unusual, so that few surgeons have had much experience.

These two young surgeons were suddenly confronted with 150 soldiers whose toes or feet, fingers or hands, were the seat of gangrene of varying extent, and the lesions had been of eight days' duration. The soldiers had been suddenly caught in the trenches in a snow storm followed by a piercing cold wind. Most of them had remained unprotected for at least forty-eight hours.

¹ Beitr. z. klin. Chir., 1913, lxxxvi, 395.

² Johns Hopkins Hospital Bulletin, July, 1912, xxiii, 191.

³ December, 1913, p. 249.

⁵ Deutsche Zeitschr. f. Chir., 1914, exxvii, 518.

⁴ Loc. cit.

Practically none of these patients had had any first treatment, so that the surgeons can give no data as to what should be done in the early stages. They were confronted with necrotic tissue and gangrene of either the moist or dry type, with varying degrees of infection.

It is interesting to note that among 150 cases there was but one example of tetanus, which began on the ninth day, and, in spite of immediate and large doses of the antitoxin, death followed quickly.

I have already pointed out, in the review of tetanus this year, that although it is infrequent in frost wounds, it is usually fatal. On account of the anemia in the beginning of the frost wound, the tetanus bacillus has no opportunity to get into the circulation, but it finds a good medium in the necrotic tissue, so that when the portal of entrance is opened by the return of circulation and granulation tissue, large amounts of the toxin get into the circulation in a short space of time. The symptoms are severe and the mortality is high.

No cases of erysipelas were observed in this group of 150 patients.

The infections were chiefly observed in the foot, where the type of moist gangrene predominates and where infections extend by continuity along the fascia and tendon sheaths and into joints. Prompt deep incisions opening up the infected area as a rule check the purulent process.

In the frost wounds of the fingers and hands, the gangrene was of the dry type; infection was very infrequent.

These observers could see no relation between the type of foot gear and the occurrence and extent of frost gangrene.

There are apparently two types of injury due to cold. In one, the degree of cold is not sufficient to freeze the tissues, but this cold, especially if associated with wetting, has a definite effect upon the circulation and produces anemic necrosis due to the contraction of the arteries.

In the second type the degree of temperature is such that the tissues are frozen irrespective of additional wetting. Meyer and Kohlschuetter are of the opinion that all of their cases of gangrene were of this type.

There is a third type in which the patients have abdominal symptoms suggesting cholera or typhoid. Here the gangrene, which often attacks the skin and other parts of the body, may be attributed to cold or freezing, but is probably due to infection.

None of these 150 cases had any abdominal symptoms but were otherwise healthy.

This type of gangrene seems to be entirely different from that due to arteriosclerosis with, or without, diabetes. If infection can be prevented and proper treatment instituted, the disease is not progressive, lines of demarcation rapidly form, the reaction of the tissue not killed by cold or the circulation of which has not been destroyed by long anemia due to contraction of the arteries, is energetic, and the amount of granulation tissue thrown out is abundant, more than that observed in other

types of wounds. Even the epidermization of large granulation-tissue defects is unusually rapid and complete.

The treatment, therefore, may be conservative, and the only indication for incisions in the tissue central to the gangrene is infection.

In the moist type of gangrene of the foot, the necrosis often involves the bone and deeper tissues, further than the skin, so that sometimes it is necessary to make incisions to demonstrate the extent of the deeper involvement.

In the moist type of gangrene of the toes and foot, it seems best to remove the dead tissue before waiting for spontaneous separation. In trimming this with the knife, scissors or bone forceps, it is recommended that the line of division be through involved and not healthy tissue. If the bone is destroyed, it is better to disarticulate at the joint above. This gets rid of the worst dead tissue and leaves an open wound. Incisions through the healthy tissue destroy the protective zone and open portals of entrance for infection. Amputations without the definite indication of infection which is not relieved by incisions, as a rule fail if they are within the foot, and are unnecessary if performed higher up. The object, then, of this conservative treatment is to save at least the weight-bearing portion of the ankle and foot—astragalus, os calcis, some of the tarsal bones, and, in more favorable cases, the metatarsal bones. When, however, conservative treatment fails to limit the disease, or to combat infection, the lowest successful amputation is, as a rule, a disarticulation in the ankle, removing all the bones of the foot. No osteoplastic method should be employed.

In the dry form of gangrene of the fingers and hands, as a rule it is best to wait not only for the line of demarcation, but for spontaneous separation. After this the resultant stump or stumps can be trimmed of what necrotic tissue has not separated. This, as a rule, will be bone, and sometimes tendons. By this conservative method, a more useful hand results.

We can see from this report that, in war, weather may be a greater destructive agency than bullets. It seems to me that soldiers should be instructed to remove their boots, in case of sudden cold with snow and wet, cut a blanket into bandages and bind their feet. In the northern woods of this country the lumbermen often employ this method when they have no better means of protection. Undoubtedly, when circumstances are such that soldiers in large numbers are exposed to the weather without protection, there will be little opportunity for early treatment of the frost wound, but I am inclined to think that even from its onset protective treatment is about all that can be employed. The tissue destroyed cannot be restored.

GANGRENE IN RAYNAUD'S DISEASE. I mention this here, because I am inclined to think that sometimes the superficial gangrene of the toes and fingers due to chilling or freezing may be mistaken for

Raynaud's disease. Some three months ago a case of this kind came under my observation. The patient was a miner, and, when seen, had various types of superficial gangrene on the ends of a number of toes and on the plantar surface of the feet. From a superficial examination it suggested Raynaud's disease, but, after rest in bed, the pain improved without any special treatment, and later the granulations thrown out as the tissues separated were so much better than I ever observed in Raynaud's disease that I became convinced that my first suspicion of frost gangrene was correct. Later, after partial amputation of toes, the wound healed more rapidly than I have ever observed in cases of Raynaud's disease.

There seems to be a great difference of opinion as to what Raynaud's disease really is. I got the impression from the two cases which I have observed that pain was a more prominent symptom than in any other form of gangrene, and that obliterating endarteritis was absent. In 2 cases operated on for me by Bernheim in St. Agnes' Hospital clinic there was no gross or microscopic evidence of obliterating arteritis in the femoral artery exposed for arteriovenous anastomosis. But this, of course, does not exclude its presence in other arteries. In these 2 cases, and in a third, not operated on, the Wassermann reaction was negative, even after repetition of the test, nor were any of the usual factors of arteriosclerosis to be made out. The 2 cases operated on have been reported by Bernheim and discussed in his recent book on Bloodvessel Surgery.

One of these cases I have seen recently (February, 1914) about three years after the first operation. This case has been reported by Bernheim.¹ It seems unique, because, in all four extremities, reversal of the circulation has been done by Bernheim. The arteriovenous anastomosis of the left femoral vessels was performed in February, 1911, end-to-end method. So that in this case the upper end of the vein and the lower end of the artery were ligated and thus practically thrown out of commission. The other three anastomoses were lateral, the last one, on the right arm, in March, 1912, more than two years ago. This patient had had symptoms for over two years—pain was intense; two toes on one and three on the other, foot had been removed. When she came under my observation, the attacks of pain in both legs were excruciating. I cannot, perhaps, absolutely agree with Bernheim that gangrene was really threatening. In addition to the pain, the patient would suddenly have an area of erythema, varying from the size of a penny to that of the palm of the hand, resembling erysipelas in color, but not associated with edema. This erythema would disappear under pressure. The area was intensely painful, the duration of the erythema lasted sometimes a week, and was followed by more or less desquamation of the epidermis

¹ Journal American Medical Association, 1913, ix, 360.

and complete restoration to normal. The areas on the toes, foot, fingers and hand were small, and sometimes, in healing, there was really superficial gangrene of the epidermis, leaving small ulcerating areas which gradually became covered with a smooth epidermal layer. The reversal of the circulation, as a rule, relieved the pain, but later there would be recurrent attacks. After the reversal of the circulation in both lower extremities, the attacks of erythema of the skin ceased, but continued on the arm. The latter also ceased after the reversal of the circulation of the upper extremity, but this patient is by no means well, although she is much improved. There has been no gangrene and only one or two slight attacks of erythema of the skin since the last operation in March, 1912. It is possible now that the patient's chief trouble is morphinism acquired during the period when it had to be given for the agonizing pain. She was bed-ridden when she came under my observation; she is now able to walk about.

My observations support Bernheim in his controversy with Coenen, of Breslau. The latter claims that reversal of the circulation in the limbs of human beings is impossible because of the obstruction by the vein valves. I get the impression from this case that, as far as relief of pain is concerned, the left limb with the end-to-end anastomosis is better than the right, but the swelling of the left leg after the patient has been a few hours on her feet gives a great deal of discomfort.

In the third case I am not sure whether I am dealing with what we might call Raynaud's disease, or the arteriosclerosis frequently observed in young individuals secondary to some infectious disease. In this case the intense pain in the left leg was present, and there had been gangrene of the great toe. The wound had not healed after amputation. Projecting from the wound was a piece of necrotic bone surrounded by poorly nourished granulation tissue. Some months before I saw the patient the popliteal artery had been explored, and the surgeon stated that this artery pulsated and seemed normal to palpation.

When I examined the patient I could not get pulsation in the popliteal artery and its branches in either extremity, yet, there had never been any pain in the right leg. Except from what the patient told us about the pain and the gangrenous toe, there was no difference between the right and left leg. Tenderness was also present in the area of pain from the knee down, most marked in the foot, especially in what remained of the great toe. This patient was taking six grains of morphine a day. The Wassermann reaction was negative. There was no change in the blood-pressure taken in the arm, no demonstrable changes in the retinal vessels.

The patient made a slow, but uninterrupted recovery under the constant use of active hyperemia produced by the hot-air bath. At first the affected limb was baked every three hours. He left the hospital taking no morphine and walked. He had entered on a stretcher.

William C. Lusk,¹ of New York, has reported the successful treatment of a somewhat similar case, but affecting four extremities, by the employment of the electric bath. He uses the term endarteritis obliterans, but there is no gross or microscopic study of any vessel to prove it. In my case, and in Lusk's, the attacks of erythema of the skin, observed in the case operated on by Bernheim, were absent.

Here is the place to mention the efficacy of active hyperemia in cases of this kind in the stage of pain and before the onset of gangrene. In all of the cases with intense pain which I have observed, I have been unable to get the pulse in the tibial or dorsalis pedis and it is frequently not present in the popliteal. This pain and intermittent claudication associated with obliteration of the peripheral pulse is the usual clinical picture in all cases which later come under observation with gangrene, but the length of this period varies. From my limited experience I get the impression that recognition and treatment during this pre-gangrenous stage may be of incalculable value, and that active hyperemia, either by the electric bath or the hot-air baking apparatus should be tried first. I am opposed to the Bier passive hyperemia with the rubber bandage on theoretical grounds. If these measures fail, then reversal of the circulation should be considered. The lateral anastomosis, as practised by Bernheim, should be tried first, because this is associated with much less dilatation of the vein and swelling of the limb.

Lilienthal² reports an apparently successful result after the ligation of the femoral vein only, as advised by Coenen and Leonard Freeman.³ In Lilienthal's first case he planned to perform reversal of the circulation, but, on exposing the vessels in Hunter's canal, the femoral vein was smaller than the artery and its walls thicker. For this reason he divided the femoral vein between two ligatures. Now it is my recollection that this was also the finding in the case operated on by Bernheim. Lilienthal's patient was a male, aged thirty-two years; the symptoms had been present, with remissions, for five years; five toes had been amputated, one on the left foot and four on the right. Before Lilienthal operated, there was a painful ulcer in one of the scars on the left foot. After the operation the ulcer healed and the patient was apparently well one month later. But from this recent result no conclusions can be drawn. Sachs' diagnosis in this case was Raynaud's disease.

In the second case reported by Lilienthal, the operation consisted only of the ligation of the varicose saphenous vein, and relief followed. This case, also, cannot be considered conclusive, because it was observed only a few weeks after operation. In Raynaud's disease, and in all forms of impaired circulation due to different types of arteriosclerosis, complete temporary relief is often observed, even without treatment.

Lusk, in the discussion of these cases, speaks of the importance of considering the syphilitic factor, and, even though the Wassermann be

¹ Annals of Surgery, 1913, lviii, 670.

² Ibid., 1914, lix, 795, 796.

³ Transactions of American Surgical Association, 1913, xxxi, 248.

negative, of giving specific treatment, in addition to the electric bath. Freeman¹ discusses chiefly reversal of the circulation and states that at that time there had been some 50 or more published cases with most conflicting results. Freeman then reports a case of his own. The method was lateral anastomosis of the femoral artery in Hunter's canal. The improvement in the circulation of the foot was immediate and lasted several weeks, but later gangrene of the great and second toes appeared and then extended to the dorsum of the foot. Eight and one-half weeks after the operation, the leg was amputated below the knee. Before amputating, the lateral anastomosis was exposed and examined, and the anastomosis was found to be closed by a clot. So this case cannot be urged against the efficacy of the method. This complication, of course, must always be considered. Freeman, from a study of the literature, was not enthusiastic about reversal of the circulation, but agreed with Lilenthal that it should receive further consideration.

Before closing this discussion, I wish to refer to two articles which appeared in 1908 and which were apparently overlooked in my previous reviews: One by B. Sachs² on Raynaud's disease (erythromelalgia) and the allied conditions in their relation to vascular disease of the extremities, and one by Buerger,³ on Thrombo-angiitis Obliterans, a study of the vascular lesions leading to presenile spontaneous gangrene.

ARTERIOVENOUS ANASTOMOSIS. The most recent American contribution to this subject is by Charles Goodman,⁴ of New York, who reviews the literature, discusses the cases and reports 16 new cases operated on in Beth Israel Hospital. Among these there were 6 definite successes. There were 8 cases which at first promised success, but later required amputation. The method of anastomosis was end-to-end in 13, 1 lateral; in 2 cases the anastomosis could not be performed on account of the presence of thrombosis. From this clinical experience and from animal experiments, Goodman favors end-to-end anastomosis. The operation must be done before gangrene sets in, if possible. But in non-septic gangrene the anastomosis may allow a lower amputation. My own experience with 1 case makes me feel uncertain as to this point. Goodman gives the entire literature.

Muscles. The literature on injuries, infections and tumors of muscles has been so thoroughly discussed in previous numbers of PROGRESSIVE MEDICINE⁵ that in future we shall deal only with unusual conditions.

MYOSITIS OSSIFICANS PROGRESSIVA. Erich Blenkle⁶ reports the seventy-third case of this rare general disease. Its infrequency is shown by the fact that since 1897, when 68 cases were collected, but 5 new cases have been reported in the literature. The case reported by Blenkle was chronic from the onset, and the acute attacks of pain, swelling and

¹ Loc. cit. ² American Journal of the Medical Sciences, 1908, xxxvi, 560.

³ Ibid., p. 567.

⁴ Annals of Surgery, 1914, Ix, 62.

⁵ December, 1913, p. 252.

⁶ Archiv f. klin. Chir., 1914, ciii, 763.

fever were not observed. These remittent attacks have been used as clinical evidence of the inflammatory nature of the progressive disease, but the majority of authorities from pathological evidence are of the opinion that it is not inflammatory, and the acute attacks with fever are absent in many cases. The beginning of the disease is often so obscure and chronic that it is very difficult to tell, from the statements of the patient and his family, exactly how it began. For example, in this case they were of the opinion that it began in the arms, yet the *x*-ray investigation would seem to indicate that the bone formation in the back and the nape of the neck were of longest duration.



FIG. 56

This multiple, progressive lesion seems to have no relationship to the local disease involving the single muscle. The bone formation is primary in the connective tissue and only secondarily involves muscle and bone. Blenkle is of the opinion that it should be called *polyossificatio congenita progressiva*. The disease is associated with other developmental defects, for example this patient, aged twenty-one years, corresponded

in size and development to a boy of twelve. The etiology and treatment of this disease are still obscure.

Fig. 56 shows the bone formation in the muscles of the back and Fig. 57 in the adductors.



FIG. 57

Tendons. SNAPPING SHOULDER. I have discussed jerking finger¹ and snapping hip.² A. Reich³ reports a case of jerking, or snapping, shoulder, but was unable to find any similar cases in the literature, although he found references to the finger, knee and hip. He is of the opinion that they may have been reported under different titles, or observed and not reported.

The patient was a male, aged twenty-four years, who had observed pain in the right shoulder for some time, but it had not prevented full function of the arm. Three months before he came to the surgical clinic in September, 1913, he fell on the right elbow. Not until four days later did he notice pain of greater degree in the right shoulder, and, in addition, when certain motions of the shoulder were made, especially when the muscles were tense, as in carrying or lifting, he heard a snapping noise, and when he placed his hand to the medial side of the shoulder he felt something strike his fingers as if there was a cord beneath the skin. This grew worse and incapacitated him for work. At the examination nothing could be palpated in the passive state, and the x-rays showed

¹ PROGRESSIVE MEDICINE, December, 1912, p. 290.

² Ibid., p. 294.

³ Beitr. z. klin. Chir. 1914, xc, 631.

no abnormalities, but when the patient made motion with muscles tense, what he stated could be felt, was made out. Below a point corresponding to the coracoid process, in the region of the short head of the biceps, a cord-like substance snapped up against the palpating finger and at that moment a noise could be easily heard.

The exploration found an unusual fissure between the short head of biceps and the coraco-brachialis below their origin from the coracoid process. When the arm was rotated in, the fissure widened; when it was rotated out, the fissure closed. Through the fissure the finger palpated the lesser tuberosity of the humerus, and one could readily see and demonstrate that one of these tendons, when tense, could easily snap over this projecting bone, but as the patient was relaxed under ether narcosis, the snapping noise could not be reproduced. However,

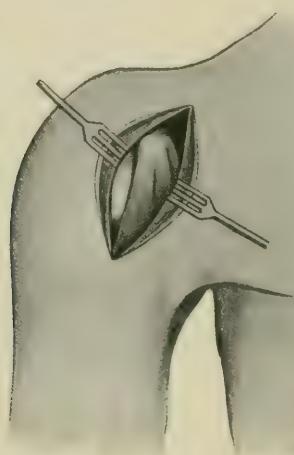


FIG. 58

after firmly closing this fissure with silk and doing nothing else, the patient was absolutely relieved of pain, and, when examined one month later, there had been no recurrence of the noise or the snap. Fig. 58 is a sketch of the anatomical findings at the operation. The area was exposed by separating the deltoid from the pectoralis major and ligating the cephalic vein.

The description of this case is unusually clear and convincing, and will probably lead to the recognition, relief, and report of other cases.

RUPTURE OF THE LONG BICEPS TENDON. Eduard Borchers,¹ similar to Reich, writes from Perthes' clinic in Tuebingen and adds two operative cases of rupture of the tendon of the long head of the biceps. He refers to, and discusses, the best literature on this subject up to date.

¹ Beitr. z. klin. Chir., 1914, xc, 635.

In the first place, rupture of this normal tendon probably never takes place. There is always a preceding arthritis deformans of some degree, and the intra-articular portion of this tendon in its bony groove is weakened and frayed by constant friction with some osteophyte formation.

Apparently many physicians do not realize that joint-changes may go on for some time without symptoms, or with such slight pain and loss of function that the patients do not consider it necessary to seek advice. In the shoulder-joint, in early cases, the new-bone formation may not be seen in the *x*-rays because it is much more difficult to get a picture from the proper view-point here than in the elbow and knee. For this reason the first symptom of the arthritis deformans of the shoulder may be associated with rupture of this tendon. As a rule the patients give a history of a recent trauma, and in the past the rupture has been attributed to the trauma only.

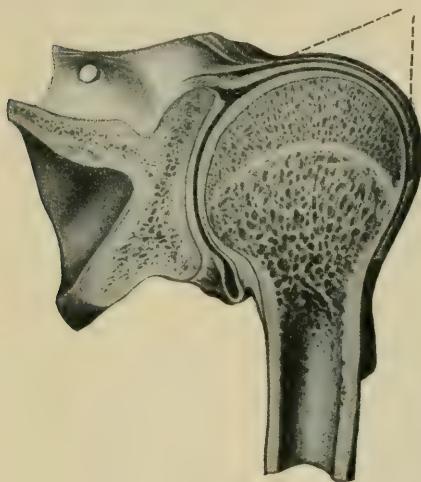


FIG. 59



FIG. 60

Autopsy and *x*-ray studies demonstrate that, after forty years of age, arthritic changes due to many etiological factors are very common in the larger joints. The relationship, however, of rupture of the long tendon of the biceps was not established until 1909 by Ledderhose. In some cases the patients feel a sensation of rupture at the time of the break; in others, the pain of the trauma masked this other sensation. Fig. 59 illustrates the anatomical relations of the tendon to the joint, Fig. 60 the typical clinical picture when it is present—the contraction of the muscle.

There have been ten previously reported operative cases. The method of suture depends upon the position of the rupture. If it is intra-articular, the continuity of the tendon cannot be replaced, and for this reason, it should be sutured to the coracoid process. If the rupture, however, is in the tendon outside the joint, its continuity can be restored. In such cases it is important to chisel away the osteo-

phytes over which the tendon had become frayed before rupture, to restore the groove, because, as a rule, this has been filled up by the inflammatory process. Most observers believe that dislocation precedes rupture. After the suture is complete, the tendon should be protected by covering it with some transplanted tissue.

I would advise my readers to bear this in mind. I am quite convinced that this is a lesion often overlooked, and patients have been allowed to go on with their disability when a simple operation would have relieved them.



FIG. 61

TRANSPLANTATION OF TENDONS. Eduard Rehn,¹ from Lexer's clinic in Jena, gives us a clinical contribution on their results in the free transplantation of tendons in that clinic. Rehn's experimental work on the homo- and autotransplantation of tendons is well known. When applied to human beings it was found that autoplastic methods yielded, on the

¹ Archiv f. klin. Chir., 1913, cii, 15.

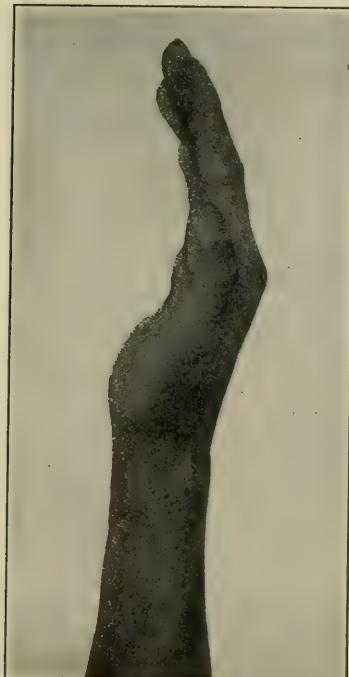
FIG. 62 *a*



FIG. 62 *b*



FIG. 62 *c*



whole, the best results. The tendons most available are the entire *palmaris longus*, splits from the extensors of the toes, and, when wider pieces are required, slices from the *tendo-Achillis* and *rectus femoris*. One should read the original for details, as attention to these minute matters has much to do with the result. Passive motion must be begun early. The free transplantation of tendons has advantages over silk and other foreign material. Fig. 61 will give an idea of the method of introducing the transplant to the tip of the index finger without a long incision. This method of tunnelling should be employed in all superficial places. The long incision not only increases the risks of infection, but also the probability of adhesions. Fig. 62, *a*, *b*, and *c* illustrate the wonderful functional result: 62 *a*, the condition before operation; 62 *b*, and 62 *c*, the condition after it. Rehn is of the opinion that the work of Lewis and Davis supports his contention in regard to the free transplantation of the tendons, and that Murphy, of Chicago, emphatically favors the autoplasic method.

Herbert P. H. Galloway,¹ of Winnipeg, describes in detail, with many illustrations, his observation on the ordinary transplantation of tendons for paralytic deformity. This, of course, is a simpler problem than the free transplantation. He is of the opinion that the transplanted tendon end should preferably be fixed to bone or periosteum rather than to tendon or other soft tissue; that the tendon should be stretched moderately before it is secured; that the suture material should be of a character that will hold for several weeks; that the transplanted tendon should always have a subcutaneous tissue cover in addition to skin, and that six weeks should elapse before the tendon in its new condition is allowed to functionate. He then gives a detailed account of the various transplantations with photographic illustrations.

SILK FOR TENDON PLASTICS. Carl W. Henze and Leo Mayer² report their experimental investigation in the laboratory of Lange's clinic in Munich. The object of this investigation was to devise means to prevent postoperative adhesions. They are of the opinion that this is best accomplished by Biesalski's method, which consists in running the transplanted silk tendon through the sheath of the paralyzed tendon. All artificial methods, by implanting living tissue or imposing foreign bodies, increase the tendency to adhesion. Perhaps the Cargile membrane may be an exception. The adhesions, as a rule, take place not about the silk, but about the end of a transplanted muscle or tendon.

In PROGRESSIVE MEDICINE for December, 1912 (p. 289), and 1913 (p. 267), will be found a review of other lesions of tendons.

Fascia. TRANSPLANTATION. I³ began the discussion of this in 1912 because of the splendid experimental work of John Staige Davis, and

¹ Surgery, Gynecology, and Obstetrics, 1913, xvi, 84.

² Ibid., 1914, xix, 10.

³ PROGRESSIVE MEDICINE, December, 1912, p. 286.

continued it last year.¹ It is to be recollected that the beginning of free transplantation of fascia dates back only to 1910, to the contributions of Kirschner.² Since then the literature on experimental and clinical work has been increasing rapidly. I have previously stated that up to 1913 transplanted pieces of fascia have been employed practically everywhere to fill defects and to strengthen sutures. Apparently the fascia lives, but we must always bear in mind shrinkage. The technique of obtaining the fascial transplant is important, and special instruments have already been devised.³

O. Kleinschmidt⁴ contributes a histological study demonstrating, by means of vital staining, that the transplanted fascia lives; reconstruction is always in the direction of tension and begins about the fourth week; when one employs the transplant for tendon and muscle defects, it is important to place the piece so that the direction of the tension will be in the direction of the longitudinal fibers of the fascia, as these are the strongest.

Martin Kirschner⁵ now contributes a most wonderful monograph of 141 pages and the literature on the status and prospects of autoplasic free transplantation of fascia. The table of contents of this monograph is well worth reproducing here and gives a very good picture of this new chapter of surgery.

A. General Part.

1. The problems of the work.
2. The tendency of the fascia to heal in.
3. The histological fate of the transplanted fascia.
4. The sources of material and general technique of transfer-
ence of fascia.
5. The fate of the area furnishing the transplant.
6. The superiority of autoplasty over other forms of trans-
plantation.
7. The superiority of fascia material over other competing
materials for transplantation.

B. Special Part.

- I. The employment of fascial bands.
 1. The formation of artificial tendons (substitution of tendon defects) and strengthening of tendon sutures.
 - (a) Disadvantages of artificial silk tendons.
 - (b) Disadvantages of free transplantation of tendons.
 - (c) Defects of simple tendon sutures.

¹ PROGRESSIVE MEDICINE, December, 1913, p. 270.

² Archiv f. klin. Chir., 1910, xcii, 888.

³ PROGRESSIVE MEDICINE, December, 1913, p. 271, Fig. 47.

⁴ Archiv f. klin. Chir., 1914, civ, 933.

⁵ Beitr. z. klin. Chir., 1913, lxxvi, 5.

- (d) Strengthening of tendon sutures with fascial cuffs and the formation of artificial tendons from fascia.
- (e) Supplement: The greatest possible limitation of plastic operations.
- 2. The correction of paralysis of the facial muscles.
 - (a) The correction of ptosis.
 - (b) The correction of facial paralysis.
- 3. The substitution of joint ligaments.
 - (a) The treatment of flat-foot and other deformities of the feet.
 - (b) The treatment of habitual dislocation of the peroneus.
 - (c) The treatment of habitual dislocation of the patella.
- 4. The correction of deviations of the scapula.
- 5. The treatment of habitual dislocation of the shoulder.
- 6. The fixation of parenchymatous organs.
 - (a) Nephropexy.
 - (b) Orchidopexy.
- 7. The employment of fascial rings in intestinal surgery.
 - (a) Closure of a normal intestinal passage.
 - (b) The treatment of prolapse of the rectum.
- 8. The utilization of fascia as suturing material.

II. The employment of fascial plates.

- 1. The radical treatment of epigastric, umbilical and lateral ventral herniæ. The substitution of defects of the abdominal wall.
- 2. The radical treatment of inguinal herniæ.
- 3. The radical treatment of crural herniæ.
- 4. The care of defects of the walls of the pleural cavity.
- 5. Hemostasis in parenchymatous organs.
- 6. The strengthening of vessel suture and of the walls of aneurisms.
- 7. The closure of mucous-membrane-covered hollow viscera.
- 8. The mobilization of ankylosis joints. The covering of amputation stumps.
- 9. The care of defects in the dura.
- 10. The isolation of single portions of peripheral nerves.

The majority of the illustrations need practically no description—they speak for themselves. Fig. 63 shows the method of using fascia to bridge a tendon defect. Kirschner is of the opinion that this is superior to a free tendon plasty or silk. Fig. 64 shows his method of strengthening end-to-end tendon suture by a piece of fascia. This

rather impresses me as unnecessary, because our results by the simpler method are sufficiently good. Fig. 65 is a suggestion for the treatment

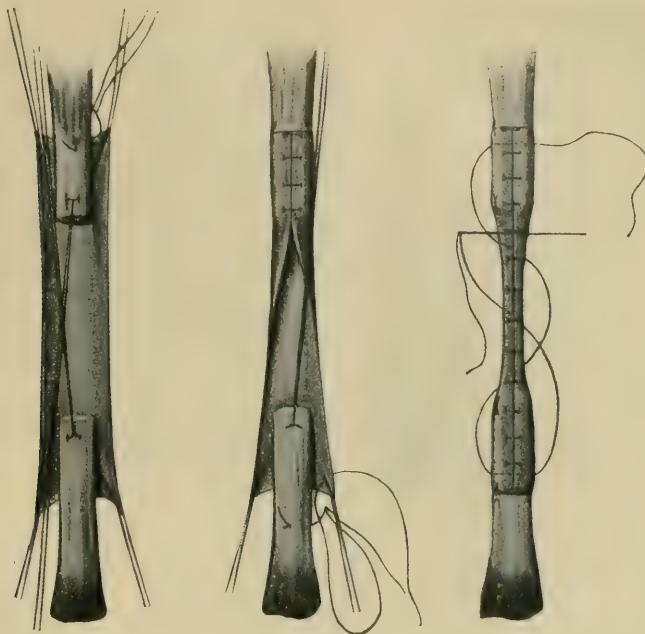


FIG. 63

of ptosis of the upper eyelid with fascia rather than the usual buried-silk method. Fig. 66 shows the employment of fascia to overcome the deformity of a facial paralysis. Fig. 67 illustrates the employment of

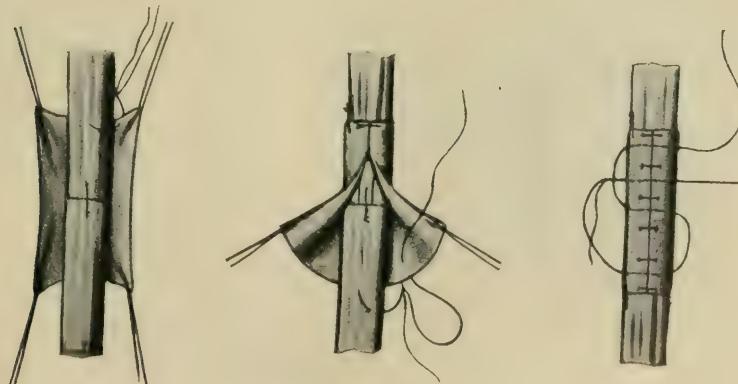


FIG. 64

fascia to retain dislocated tendons in place. Fig. 68 is a method to hold a deviated scapula in position. Fig. 69 suggests the employment of a fascial

stirrup to retain the head of the humerus in the glenoid cavity in cases of recurrent or habitual dislocation. This is a most ingenious suggestion,

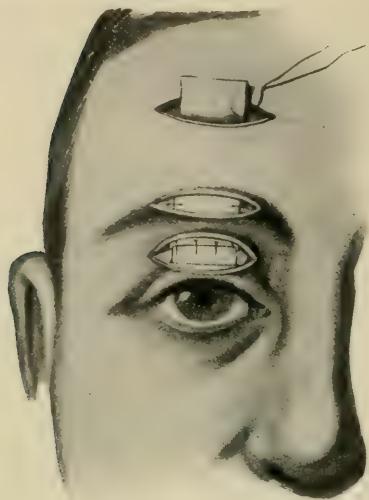


FIG. 65



FIG. 66

but gives the impression that the technique would be rather difficult. Simpler methods will probably achieve as good results. Figs. 70 and 71

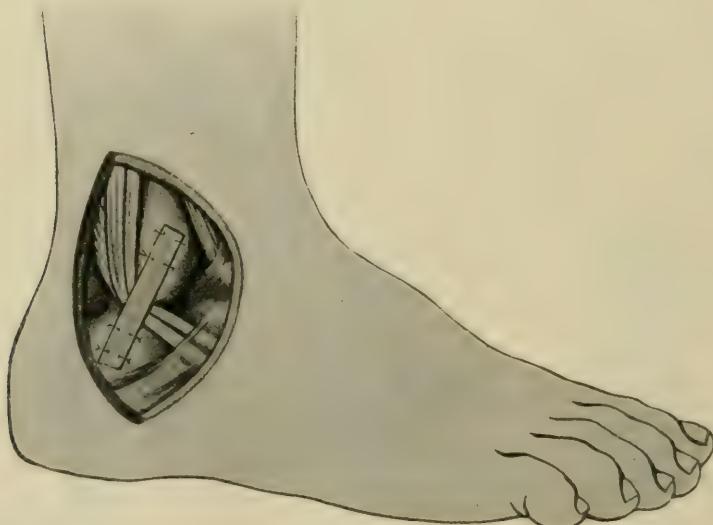


FIG. 67

show the employment of fascia in gastric and intestinal surgery. Figs. 72, 73 and 74 show the employment of fascia as an adjunct in closing

and protecting defects in the liver. Fig. 75 demonstrates how fascia may be used to strengthen vessel sutures, and Fig. 76 the strengthening of the wall of an aneurysm by a fascial coat.

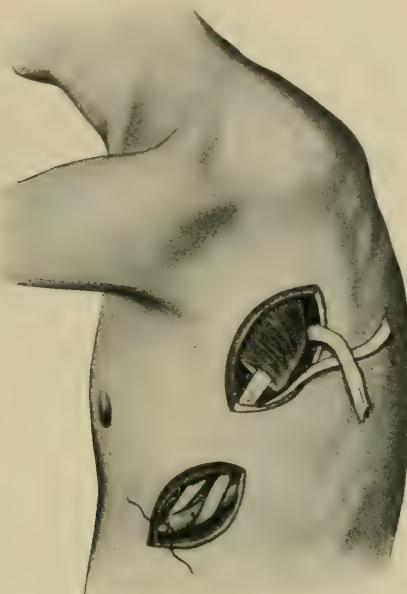


FIG. 68

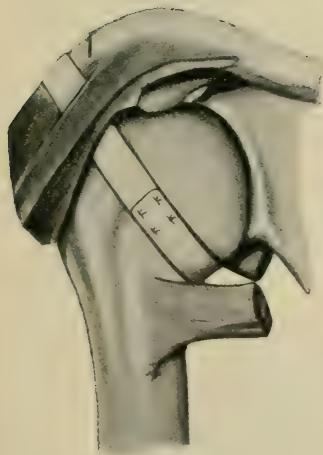


FIG. 69

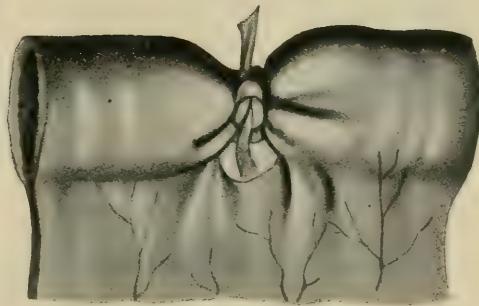


FIG. 70

We have in autoplastic fascia aseptic material which can take the place of silk or catgut ligatures and be employed in many other ways where these ligatures would be insufficient. With good technique it

seems possible to get the fascia transplant to live almost anywhere and every human being has an abundant supply for almost all conceivable emergencies.



FIG. 71

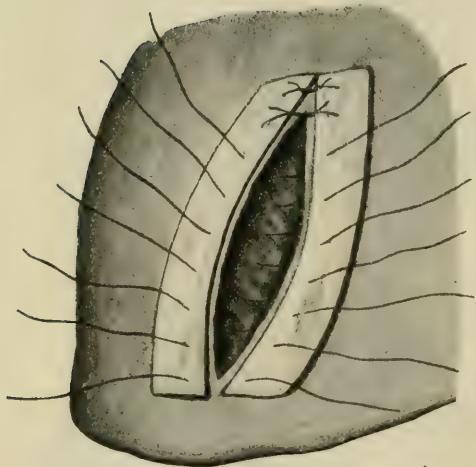


FIG. 72

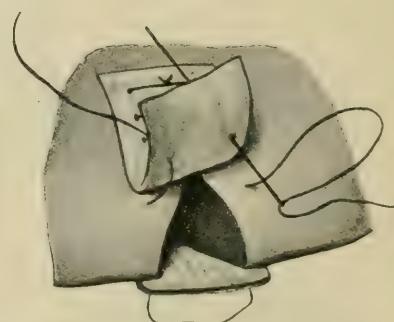


FIG. 73

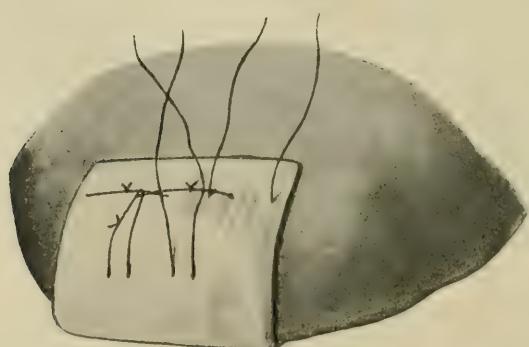


FIG. 74

The rapid development in this branch of plastic surgery in about four years and the diffusion of knowledge in regard to it demonstrates the possibility of progress in modern surgery.

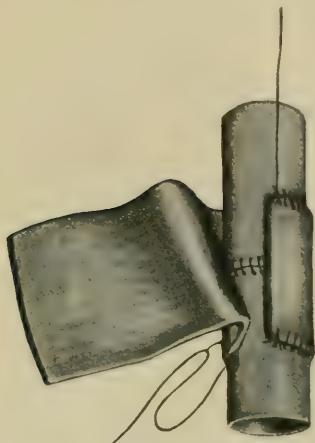


FIG. 75

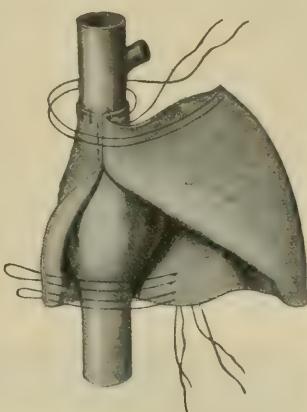


FIG. 76

Skin. HOMOPLASTIC TRANSPLANTATION. In my own observations I have never been successful with transplanting skin, unless I used the autoplasic graft, so that in the past five or more years I have not attempted anything else. Now we have a most convincing investigation of T. Oshima¹ from Lexer's clinic. He transplanted whole skin upon a healthy granulating wound and removed it at intervals in small pieces for histological examination. Up to the fourteenth day the graft had all the gross appearance of perfect healing, but after that it gradually disappeared by a process of necrosis. But histological studies from the beginning were different entirely from the autoplasic graft. Appearances of degeneration began at once. By the sixteenth day no nuclei would stain; by the twenty-eighth day no tissue except elastic fibers could be made out in the histologic examination. For this reason Oshima agrees with Lexer and others that the chances of a homoplastic skin graft in man becoming vitalized are small, if possible at all, and he questions the observations in the literature which have appeared off and on from the beginning of skin transplantation, claiming success in homoplastic grafts.

The most recent advocate of a homoplastic skin graft is John Staige Davis.² Oshima, however, is of the opinion that Davis has not furnished the evidence which will allow other observers to agree with him.

There are a number of cases in which we really need the homoplastic

¹ Archiv f. klin. Chir., 1914, ciii, 440.

² Annals of Surgery, 1909, I, 542; PROGRESSIVE MEDICINE, December, 1909, p. 219.

graft. Oshima's investigations are with whole-thickness grafts and not with the thin Thiersch grafts.

In autoplasic skin grafting, success is always more uniform with the Thiersch graft, and we must wait for further evidence before we can condemn absolutely the homoplastic Thiersch graft.

ARTIFICIAL EPIDERMIZATION. From my own observation I have been of the opinion that in the healing of a large granulating wound the good vascularization of the connective tissue and the cleanliness of the surface had more to do with rapid and complete epidermization than stimulation of the epithelium, and I have reported in *PROGRESSIVE MEDICINE* a number of observations of others calling attention to this.

In view of the danger of carcinoma in *x*-ray and burn ulcers, I have always felt that artificial stimulation of epidermis with scarlet-R, and other agents, should not be recommended.

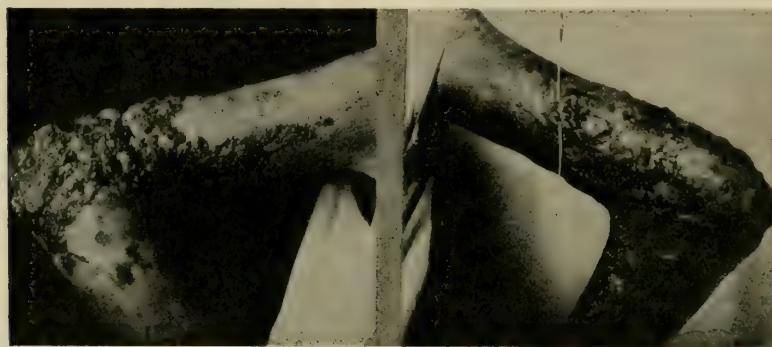
*a**b*

FIG. 77.—*a*, taken July 20, 1910. Note the marked thickening of the Thiersch grafts (the thickened grafts have begun to separate into irregular fungating masses which can be plainly seen; *b*, taken August 1, 1910. Portion of the thickened grafts have assumed the level of the normal skin. Overgrowth can still be seen in other areas. Note the overgrowth which is attached only by its edges, beneath which a probe is passed. There are a number of similar areas scattered over the arm.

There seems no doubt that scarlet-R and other allied substances do stimulate epithelial activity. Apparently there is still some skepticism, because Davis,¹ on account of this skepticism, reports a case in which he demonstrates the excessive thickening of Thiersch grafts caused by amido-azotoluol. The case reported by Davis was one of extensive burn of the arm. The grafts were autoplasic and taken from the thigh. Beginning on the second day, the grafted area was dressed with 4 per cent. amido-azotoluol ointment, alternating with boric ointment every twenty-four hours. By the fourteenth day Davis noted remarkable thickening of the grafts. The appearance of these is shown in Fig. 77 *a*, taken on the twenty-second day, and *b*, on the thirty-

¹ *Annals of Surgery*, 1913, Iviii, 451.

third day. Davis asked me to examine the sections taken from the graft on the twenty-second day and shown in Fig. 77 *a*. The microscopic appearance is illustrated in Figs. 78 and 79. I was impressed with the

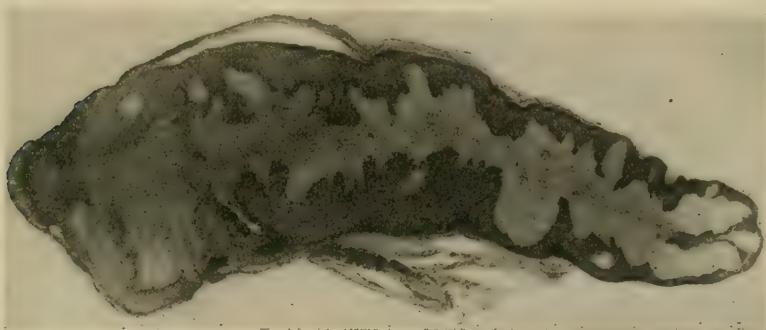


FIG. 78.—Section of small papillomatous overgrowth.

unusual thickness of the epidermis, the largeness of the papillary body and the unusual hornification of the epithelium on the surface, that is, a picture resembling a pathological process called keratosis. The mor-

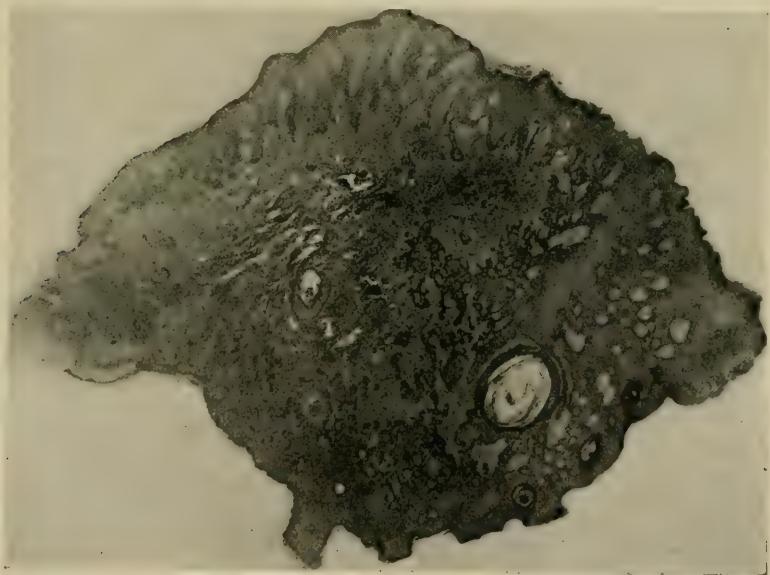


FIG. 79.—Section of papillomatous overgrowth.

phology of the basal cell was less distinct than in the normal epidermis; the connective tissue has the appearance of being edematous.

My experience, however, with studying sections from grafts is not sufficiently large to allow me to make any positive conclusions. But

how different these sections looked from Oshima's illustrations of sections taken from the homoplastic graft!

Later this roughness of the surface of the grafts in Davis' case disappeared, and two years later they did not differ from the ordinary picture of a successful Thiersch graft.

This case reported by Davis, however, hardly recommends such a dressing after grafting.

DANGER OF CANCER. Fr. Esslinger,¹ in reporting on the experimental and clinical investigations of the employment of crude paraffine oil as a substitute for scarlet-R, states that as yet no cases of carcinoma have developed after the employment of chemical substances to stimulate epithelial growth, at least he knows of none.

It is to be remembered, however, that the experiments of Fischer with scarlet-R date back only to 1906, and the clinical employment to about 1908. This leaves a period of but six years. From our knowledge of the relation of carcinoma to various etiological factors, this period is still too short to absolutely exclude the later development of carcinoma. I have recently observed the development of carcinoma in a minute *x*-ray ulcer which had been treated for a long time with scarlet-R. This, of course, is not absolute proof, but the patient had many areas of *x*-ray keratosis. However, in the area in which cancer developed I got the impression, though not the proof, that scarlet-R had been applied here more continuously than in any other spot.

Esslinger mentions another interesting fact. In the so-called occupational cancers, the chemical substance with which the workers come in contact, is now known to be a substance which will stimulate epithelial growth. For example, the aniline dyes in fuchsin workers, the paraffine in paraffine workers, the soot in chimney sweeps, the tobacco in cancer of the lip and the mouth. These chemical substances cause irritation both at the portal of entrance and, when they are absorbed at the portal of exit, for example, cancer of the bladder in coal-tar distillers. Another interesting observation is that indol and scatol, products of protein putrefaction, are also stimulating to epithelial overgrowth. We are now beginning to feel that in cancer of the stomach and intestines there may be some relationship to overeating, especially of meat. Lane is of the opinion that intestinal stasis is one of the factors of cancer of the mucous membrane of this tract. Yet he gives paraffine oil which, we now know, has a stimulating influence on epithelial growth.

In spite of these suggestive, but not positive facts, Esslinger and others recommend the employment of these chemical substances to hasten healing of ulcerating surfaces.

Personally, I wish to record again my objections to any of these methods. In the first place it is questionable whether they are neces-

¹ Beitr. z. klin. Chir., 1913, lxxv, 715.

sary, and in previous numbers of PROGRESSIVE MEDICINE I have quoted the observations of others which confirm my own, that rapid epidermization can be accomplished in a large number of cases by simpler methods and without chemical stimulation of the epidermis, and, when these fail, we have a far quicker and more efficient method—autoplastic skin grafting. This operation is not a difficult one, the grafts can be cut under local anesthesia or light gas. With this method the period of disability is always short, it is more economical in time and material.

Although the danger of using these substances for stimulating epidermization may be remote and still unproved, it is my opinion that they should not be employed.

BLASTOMYCOSIS. In PROGRESSIVE MEDICINE for December, 1907, p. 200 (Figs. 80 and 81) I reported a case in which the active lesion on the leg clinically suggested carcinoma. It had been present three months and was excised on the diagnosis of malignancy, and the area grafted.



FIG. 80

The patient also had some healed areas on the forearm and face which had been observed some years before and healed spontaneously with slight scars, as shown in Fig. 81. The section from the removed tumor undoubtedly showed blastomycetic dermatitis, but the downgrowth of epithelium could not be distinguished from other sections which we looked upon as carcinoma. The case is interesting, because I have examined the patient within a few days—now eight years since the operation. There has been no recurrence, and no appearance of any other skin lesion. The patient is in good general health. I mention the case here to impress my readers with the now well-recognized fact that syphilitic, tubercular and blastomycotic lesions of the skin may be associated with hypertrophy of the epidermis, atypical downgrowth of epithelium into the granulation tissue, with pearly-body formation—a picture almost impossible to differentiate from malignancy. The presence of histological evidence of tuberculosis, or blastomycetes, of

course furnishes an explanation for the atypical overgrowth of the epidermis. It is my opinion, however, that if the local growth is operable, it will be safer to excise it as if it were malignant. The report of the next case illustrates the difficulty in diagnosis.

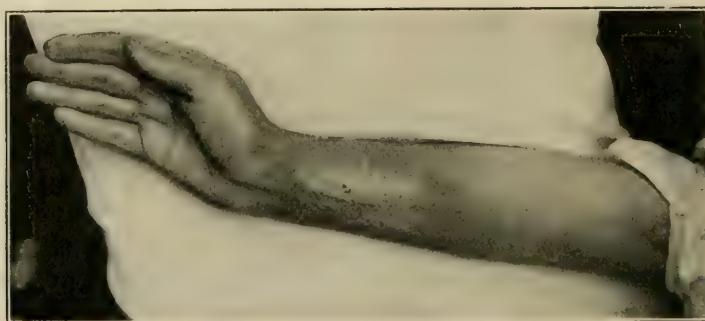


FIG. 81

TUBERCULOSIS OF THE SKIN. David N. Nabarro and T. T. Higgins¹ report on an ulcer of the nose in a girl, aged eleven. The microscopic section, as shown in Figs. 82 and 83, resemble carcinoma spinocellulare. The age of the patient—eleven—practically excludes cancer. The appearance of the ulcer (Fig. 84) would, if present on an adult, suggest

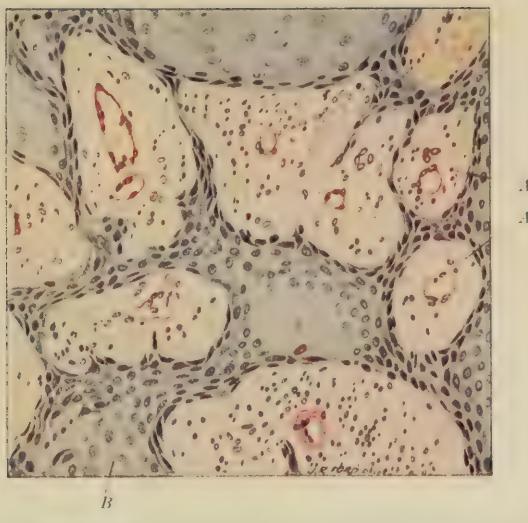


FIG. 84

cancer. The treatment began in April, 1913. The ulcer was curetted and then cauterized with acid nitrate of mercury. The microscopic sections illustrated were taken from the tissue removed with the curette.

¹ British Journal of Surgery, 1914, i, 576.

Fig. 82



B

A
A

The portion of the tissue showing the suggestion of a papilliform arrangement of the connective tissue and epithelial elements. A, A, suggestion of papilliform arrangement; B, prickle cells. $\times 165$.

Fig. 83



General appearance of the tissue removed. Note the large columns of epithelial cells with typical cell-nests. $\times 60$.

The nasal cartilages were not involved. About two weeks later *x*-ray treatment was begun, and continued several weeks without any evidence of improvement. At this time the pathological report of carcinoma was received. Then the patient received treatment with the extract of *alnus glutinosa* (common alder) recommended by Gray.¹ It is interesting to note that within two weeks after this internal medication the ulcer healed and has not recurred during an observed period of four months.

It seems to me that the result of this treatment excludes carcinoma. I read the original articles of Gray, and they contain no convincing proof of the efficacy of this drug in the treatment of cancer.

Mr. Corner, of the London Hospital, in whose clinic this child was observed, urged the record of the case to illustrate the difficulty encountered by expert pathologists in making a certain diagnosis of carcinoma in some cases.

Now that we are educating people to come earlier for insignificant lesions, I am confident that the number of such doubtful cases will increase, but, if properly treated, the difficulty of histological diagnosis will be associated with better prognosis, if the local lesion is radically excised. In the majority of cases these local lesions in their beginning can be completely removed without mutilation, and it makes very little difference then as to the microscopic interpretation.

The chief dilemma will come when the lesion is of such a size or in such a position that its radical removal, indicated by the diagnosis of malignancy, would be mutilating. This point, however, has been discussed in the chapter on tumors.

Nerves. RESULTS OF NERVE SUTURE FOR INJURY. H. Stroebel and Kirschner,² from Graser's clinic in Erlangen, report the study of 14 cases of nerve injuries examined by them from two to ten years after operation, and this careful report shows that the present-day results are not encouraging. Some of the accepted views as to the proper time for operation are incorrect.

For example, Lexer advises that for a nerve injury associated with fracture, the result of suture is just as good after a delay of four to six weeks. These investigators are of the opinion that the sooner the operation upon the nerve is done, the better. Nothing can be gained by delay.

The prevailing view of fairly good results after nerve suture is due to the fact that the average observer depends upon a rather superficial examination when other muscles may have helped out in the function of the paralyzed, and the examination for the presence or absence of the different kinds of sensory function are rarely made.

¹ Medical Magazine, May, 1907, November, 1907; and August, 1910.

² Beitr. z. klin. Chir., 1913, lxxxiii, 475.

In their cases, the function of each individual muscle was established by electric examination, and the examination in regard to sensation followed the rule outlined by Head.

Among their 14 cases examined, only 5 can be looked upon as absolutely cured, or sufficiently improved to call cured—that is, 36 per cent. Four cases were very slightly improved, and, if these are considered, the results are 64 per cent. Other observers reporting on almost 700 collected cases give a percentage of cures as from 66 to 72.

In the cured cases, the longest interval between injury and operation was two months. In not a single case in which they were unable to bring the nerve ends together was a result accomplished. Neurolysis of nerves caught in scar tissue failed.

From theoretical considerations, one would naturally conclude in favor of early operation. The longer the delay, the greater the scar tissue, and this makes the operation technically difficult. But during this delay, changes are also taking place in the muscle.

I agree with Stroebel and Kirschner that even in recent years less attention has been paid to nerve injuries than to those of vessels and tendons. Careful examinations as to the possibility of paralysis of the nerve after a trauma are conspicuous by their absence. Most of these cases come to surgeons late, usually months, sometimes years after the injury. The statement of Lexer in his text-book, and other statements along the same line, that the operation may be delayed for six weeks without interfering with the result has had its influence.

We can at least improve this factor of earlier intervention. When it comes to the technique of suture, Stroebel and Kirschner express the opinion that simple approximation of the two ends by suture is sufficient, that the protection of the suture with transplanted tissue, such as fascia, or a vein tunnel, promises nothing. This latter point, however, is by no means proved.

Martin Kirschner,¹ whose monograph on the transplantation of fascia has just been discussed, advises the employment of a fascial transplant, but gives no late results to prove his point.

Now we come to a report by W. Denk² of forty-five isolated injuries of large peripheral nerve trunks observed in a military hospital in Sophia.

This observation is disappointing because the surgeons left the hospital within two months after these cases were treated and six months later could trace but three of the patients; two of these reported no improvement of the paralysis, one but slight improvement. Of course this proves nothing, because Stroebel and Kirschner have shown that, although in a very few cases some signs of improvement are noted in

¹ Centralbl. f. Chir., 1913, xl, Supl. 105.

² Beitr. z. klin. Chir., 1914, xci, 217.

from six to eight weeks, yet this does not occur before one year in the majority of cases.

These nerve injuries came to the military hospital in Sophia late, from four to six weeks after the injury. Among the 45 cases, there were only eleven fractures. In one injury of the sciatic nerve, the femoral artery had also been injured. Most of the patients suffered from pain, some so excruciating that even the largest permissible doses of morphine did not give relief. These, of course were the patients who wanted to be operated on, but there were only eighteen operations. In every instance Denk believes that the nerve was in the track of the bullet and had been injured by it and not secondarily by the fracture, in the cases in which a fracture was also inflicted. It is also interesting to note that in fifteen of the eighteen operations, the incompletely divided nerve was peeled out of the scar tissue, in two cases resected and sutured. In most of the cases the suture was protected by a fascia-lata flap. Denk also advises waiting for three or four weeks after the first injury, in spite of the signs of paralysis. I cannot agree with him, but agree with Martin Kirschner¹ that one should operate at once in all cases, and as early as possible. It is true that in some instances, in spite of all the sensory and motor signs of paralysis, the nerve will be found to be absolutely uninjured, but no harm need be done by such an exploration. When the nerve is not ruptured, but simply caught in scar tissue, it should be dissected free. Partial rupture should be treated the same as complete—resection and suture. In all instances he recommends protection with a fascia transplant.

M. Gerulanos,² from his experience in the Balkan wars, comes to the following conclusions:

The frequency of fire-arm injuries of nerves in war is about 1.5 per cent. of all injuries; they are much less frequent than injuries of the large vessels.

The most frequent are injuries of the brachial plexus from the supraclavicular region to the axilla (31 out of 68 cases) and next in frequency are those of the upper arm (21 of 68 cases).

The *radialis* is the most frequently injured nerve trunk, and in two-thirds of the cases complicated with a fracture of the arm.

In the supraclavicular region at the origin of the plexus, in addition to perforations, tears and contusions of single roots, some of the roots, or all of them were imbedded in scar tissue.

The severest injuries are those of the plexus in the axilla, usually complicated with injuries of the vessels and aneurisms.

Great damage is done in all regions by secondary effects of scar tissue, which may permeate and destroy such large trunks as the sciatic.

¹ Centralbl. f. Chir., 1913, xl, Supl. 105.

² Beitr. z. klin. Chir., 1914, xci, 222.

Not all cases with nerve paralysis require operative intervention. Many, about 30 to 40 per cent., may recover without operation. We are dealing in such cases with nerve concussion or infiltration by a serous exudate due to injury of the surrounding soft parts.

Operative interference in war should be undertaken in the fourth to sixth week, when function has not returned in the meantime.

At operation, which is to be conducted according to the well-known principles, one should be as radical as possible as regards resection of the nerve.

The time until return of function after operation is long. In cases with severe injury of the surrounding tissues, even after simple neurolysis, function does not begin to return until after many months.

As regards the ultimate results in these cases but little that is definite can be said, because the time since the operation is not long enough.

Of the 25 cases which have been examined since, 9 have been cured, 14 are continuing to improve, 2 have remained uninfluenced.

Borchard¹ summarizes his experience over a large number of years and 49 cases of peripheral nerve injuries. He emphasizes that the longer one waits after the original nerve injury, the more difficult the problem. In the first place there is the scar tissue, and, in the second place, a wider nerve defect. The probabilities of regeneration are best when healthy nerve trunks are approximated end-to-end without tension, and it is conceded that the chances of doing this are best soon after the injury. Immediately after the injury there appear to be some contra-indications to operation. The nature of the wound may be such that one must wait until the danger of infection has passed. Even in wounds in which the danger of infection is least, the extravasation and hematoma appear to be obstacles to immediate intervention. In some cases of fracture where there is no indication to operate upon the fracture itself, it seems wiser to reduce the fracture and wait at least for the beginning of bony union. Then again, in the very freshly injured nerve, sutures do not hold as well as two weeks later. But, in spite of these obstacles to early intervention, one can easily see that Borchard is of the opinion that, other things being equal, intervention should be performed two weeks after the injury.

There will be some cases in which the nerve appears uninjured. Borchard recommends Bardenheuer's procedure—division of the sheath. The contusion which has produced paralysis is always followed by infiltration within the sheath. This division relieves tension and, according to Borchard's and Bardenheuer's observations, more cases recover after such an intervention and more rapidly, than without it.

When the intervention for some reason is later, the scar tissue must be isolated from around the nerve and that between the nerve ends resected.

¹ Beitr. z. klin. Chir., 1914, xci, 634.

The resection must be within healthy nerve tissue. In all nerves there is considerable elasticity and the defect can be bridged by stretching: in the musculospiral 3 cm., in the sciatic 6 cm., is possible. Flexion of neighboring joints helps.

What is one to do when the defect cannot be overcome by these methods? Borchard is of the opinion that shortening of the bone is, if possible, the method of choice. This is easiest when there is a fracture, or when the nerve injury is in the arm or thigh where there is but a single bone. If, for some reason, this shortening of bone is contra-indicated, nerve plasty must be performed, but the chances of a good result are never as favorable.

In all cases, even the simplest, where the sheath only is divided, the nerve should be protected from the scar tissue of the original wound and from that of the operative wound. Borchard is of the opinion, and Bardenheuer agrees with him, that the best protection is afforded by a muscle flap. The flap is arranged in such a way that the nerve and blood-supply of the muscle or muscles is uninjured, and the uncut surface or surfaces cover the nerve trunk. Borchard believes that this method is better than that with fascia, and claims that the covering of the nerve with a transplanted piece of vein has not been satisfactory.

In the union of divided nerve trunks we have to bear in mind not only the absolute approximation of the trunk, but this should be done in such a way that in healing there will be the least scar, because, for the restoration of function, there must be regeneration of the axis cylinders through the defect.

I have presented this recent literature in greater detail because nerve injuries in civil surgery are infrequent; even these few cases are, as a rule, treated late, and the majority of surgeons have not kept up with the most recent experience and investigation. The suture must be carried out with the greatest delicacy, with the finest material—silk or catgut, with the least number of sutures, and, if stretching is necessary, with the least trauma, and the restored nerve must be protected in the most painstaking way. Personally, I have always employed the muscle transplant, as theoretically this is living tissue and should be safer and give rise to less postoperative scars than any freely transplanted tissue, such as fascia or vein. Nevertheless I am free to confess that after careful reading of the literature and my own experience, I am convinced of but one certain fact and that is—the earlier the intervention the better. Delay simply adds obstacles.

As far as I can make out, the best results obtained are in those cases in which the nerve has been injured during an operation and immediately sutured, or has been resected and then sutured. Even good results have been obtained when there has been a large defect bridged by nerve plasty. In these cases the restoration is immediate, and there is no danger of scar formation, except from the operation itself.

I also get the impression that in traumatic injuries of nerves the danger of immediate intervention is somewhat exaggerated. An element of fear may hold the surgeon's hand. The knowledge of poor results influences him to wait until the operation is inevitable, and therefore, naturally, less hopeful of restoration. But, if the operation fails, the surgeon can always excuse himself by the statement that in the hands of the best surgeons the chances are at best only 60 per cent., while if the operation is performed at once and failure follows, someone may ask, was it really necessary? Unfortunately, this state of affairs has been a definite factor in delaying operations also in many other departments of surgery.

What we need now more than anything else is the actual report of cases similar to that in the article first reviewed (Stroebel and Kirschner). What we wish to know is the interval of time between the injury and the operation, the exact findings at the operation, the method of restoring nerve continuity, and the ultimate result, checked by a most careful electric study for motor function and examinations of sensory restoration after the methods of Head.

Free Transplantation of Tissue. We have mentioned so far in this discussion the transplantation of skin, fascia and tendons, and before discussing the transplantation of bones and joints, it would seem appropriate to review some of the general articles on transplantation. This subject occupied a day at the recent meeting of the International Society of Surgery, and two of the most comprehensive papers by Lexer and Ullman¹ have been published. Then there appeared in April a most thorough collective review by Phemister,² of Chicago.

The conception of the possibility of free transplantation of tissue antedates Lister's period. In 1809, Merrem successfully transplanted bone plates into the skulls of animals after trephining. The work of Ollier, in 1858, on the transplantation of bone and periosteum has been confirmed by recent work. Reverdin, in 1870, started the transplantation of skin, and his work was followed up by Thiersch, Krause, Wolff and Hirschberg.

The development of aseptic surgery has made free transplantation of tissue possible, because, in this operation more than in any other, pyogenic organisms must be excluded.

We, however, owe to animal experimentation the development of the technique and the possibility of free transplantation. This fact should never be forgotten.

It is true that perhaps more could be done with animals than is possible in man, because in lower animals homo- and heteroplastic transplants very frequently remain permanently in their new position, while in man the autoplasty transplant offers the chief hope of success. The

¹ *Annals of Surgery*, 1914, lx, 166 and 195.

² *Surgery, Gynecology, and Obstetrics*, 1914, lviii, 333.

failure to live or to remain in its new position is not the fault of the vascularity of the surrounding tissue, because this is the same no matter where the transplant comes from, or what tissue composes it. In homo- and heterotransplants there is some chemical difference between the fluids and cells of the transplant and the fluids and cells of the host, and this apparently leads to necrosis of the foreign tissue. But even in autotransplants difficulties are met. The more highly differentiated tissue is, as to function, the less likely is it to live when transplanted. For example, nerve cells and axis cylinders of nerve trunks always degenerate; the probabilities are that muscle tissue, even the non-striated, degenerates. So that when this tissue, muscles or nerves, is transplanted, it can simply act as a sponge or meshwork into which the surrounding tissues grow.

The more embryonic in character the tissue, the greater the likelihood of its retaining its vitality as a transplant.

Animal experiments and clinical observation prove that the transplanted tissue may live, remain viable and functionate, but, on the other hand, its life may be temporary, and it is finally replaced by ingrowth from the surrounding tissues. In some instances this temporary life is as useful as permanent vitality. In addition to absolute asepsis, it is very important that the transplant should be in a vascular bed and fit snugly to the wall of the cavity in which it is placed. Dead spaces and hematomas not only endanger the vitality, but even the permanency of the foreign body. However, in some instances it is remarkable that some of these transplants do remain in spite of complications of this kind. This is especially true of bone, and Kirschner has found this even more so for fascia. Here even infection may not be followed by failure.

In man, one should always, if possible, employ an autoplasty transplant, and this tissue should be handled with the greatest gentleness. Among transplantations of glands, that of the thyroid and the parathyroids has been most successful, but, unfortunately, after a few months, or, at the longest, a few years, the transplant dies.

These three articles in such accessible American literature should be read in the original.

From an educational stand-point, there is another very important feature in the free transplantation of tissue in animal experimentation.

Here we have the best opportunity for teaching senior medical students and younger graduates the principles and applications of aseptic surgery, and also an opportunity for them to learn by their own handi-craft the technique of some of the most important and delicate operations which they will have to perform later on the human being.

As anatomy and pathology were once stepping stones to operative surgery, so we now have a third and perhaps a more important means of preparing the younger generation for the greater responsibilities of

surgery. The opportunities in the experimental laboratory are such that if they are combined with a certain amount of practical experience while assisting a trained surgeon, the younger surgeon takes his first responsibility in operation fully prepared for it and this first operation should be as safe for his human patient as his last.

Surgery of Bones and Joints. TRANSPLANTATION OF BONE. Lexer¹ mentions some of the more important indications for free bone transplantation. Defects in the cranial bone can be filled from the immediate neighborhood, taking the external table with its periosteal cover, or pieces of the tibia or scapula with the periosteum. In deformities of the face, due to destruction of bone by injury or disease, small transplants, with or without periosteum, are successful. These pieces of bone can first be imbedded under the skin of the forearm, and then, later, by the Italian method, be transferred to the nasal or facial defects. In cases of this kind there is no proper bed in the nasal or facial defect for the bone, therefore the bone is first transplanted where we are certain that it will live, and beneath that piece of skin which we shall also require for the facial defect. Defects in long bones can be easily replaced by pieces taken from other bones. The removal in longitudinal diameter of the tibia does not injure its strength. When we cannot get sufficient autoplastic material, we may employ homoplastic obtained from coincident fresh amputations. If one has not at hand the proper graft, contraction of the defect left by the resection of the long bone or in the lower jaw may be prevented temporarily by the insertion of pieces of ivory or horn, and later the bone graft can be obtained and substituted. Pieces of ribs answer well for the substitution of smaller bones. Bone grafts do not have to be placed into the defect at once, if there is no danger of contraction. For example, after the resection of pieces of tibia or radius, the remaining bone acts as a splint and the graft can be put in later. Lexer says that secondary imbedding is less prone to infection than primary.

In fixing the bone transplant, one may use fresh pieces of bone as nails, and fascia transplants may be used as sutures. The methods of fixing the transplant are as numerous as the manoeuvres of the cabinet maker.

We need not enter the discussion in regard to the importance of the periosteum, but it seems to be the consensus of opinion that fresh transplant of bone with periosteum offers a better hope of success in a defect in which the periosteum, as well as the bone, has been removed. If the periosteum, however, has been preserved, the transplant need not have periosteum. But, as Phemister writes, there seems no doubt that the endosteal cell of the bone transplant retains its osteogenetic powers.

The literature on bone transplantation is immense, and apparently the results are improving. In the observation of my own cases, and of those of my colleagues, I get the impression that in the future we

¹ Loc. cit.

must bear in mind not only the technique of getting the transplant to live, but to get it of sufficient strength and to so arrange the points of contact with the bone ends between which it is fixed, that the strength of the junction, as well as of the transplant, will be sufficient for the function of the later activity of the patient. This is most difficult in the femur, because later this bone alone must carry the weight of the body. I have observed fractures in the transplant and at the junction of the transplant with the other bone. If only one bone of the leg or forearm is involved, the strength of the transplant and the junction is less important.

In my own experience, I have usually been able to employ a longitudinal half of the remaining portion of the resected bone to fill the defect of the adjacent bone. In resections of the lower end of the femur to the knee-joint, I have substituted a longitudinal section from the tibia below. In resections of the tibia, fibula, radius and ulna, I have employed the remaining portion of that bone. This simplifies the technique. Heuer, Resident Surgeon of the Johns Hopkins Hospital, has followed the same line in two cases of the lower end of the femur for sarcoma. When one resects the upper portion of the humerus, one can take the upper portion of the fibula, place its cartilage head in the glenoidal cavity, and force the lower end of the fibula into the marrow cavity of the stump of the humerus, but it is my opinion that the portion of the fibula which enters the marrow of the humerus should be split longitudinally and this mortised. A bone entirely surrounded by periosteum forms less bone at its sawn end than when cut longitudinally, so that when one employs the entire bone the method just mentioned should be employed at the junction at which we desire to have solid bone union. The cartilage head of the fibula in the glenoidal cavity as a rule forms for itself a good joint, and many surgeons report excellent functional results. Murphy and his associate, Goldman, have shown me *x*-rays of such cases and report almost perfect function.

I am convinced from my own experience and from the literature that there is room for much improvement in our methods of mortising or fixing the transplant to the remaining bone, in order to get a union which will protect against subsequent fracture. The fixation here ultimately must be callus, any other substance employed in the beginning can only be temporary. Our chief object should be a method which will result in the greatest amount of osteoplastic tissue, that is, absolute bony union. It is quite possible that we will learn that this is best accomplished by subsequent operations. When one resects, for example, the entire lower half of the femur for sarcoma, it is an operation of sufficient magnitude by itself; then we have to transplant, and then comes the fixation of the transplant. Many patients will not stand this long procedure. We know that a transplant at a secondary operation has even a better chance of success. We may, therefore,

adopt Lexer's suggestion to more frequently employ the temporary splint, and then, at a second operation, when we have more time, transplant and properly fix.

The reading of the literature demonstrates that if it is impossible to obtain autoplastic transplants for bone and joint defects, homoplastic transplants should be taken from fresh amputations or cadavers. If these two materials are not available, heteroplastics are now and then successful, especially from monkeys. As Lexer says, the success of the transplant depends upon the fact that resorption of the dying portion must not get ahead of substitution from the surrounding parts. Kuettner,¹ before the German Surgical Congress in April, 1913, demonstrated three very wonderful specimens. Two were transplants of the upper third of the femur with its articular head, obtained from a fresh cadaver, the transplant had remained in place one year and one month, and two years and three months respectively. Here we have successful homoplastic transplants. The third was in a patient—a child—in which the fibula defect had been replaced by the fibula from a monkey. This heteroplastic transplant one and one-half years after operation shows no gross resorption changes in the *x*-rays, even the epiphyseal line is distinct. Kuettner² reports these cases in detail, with illustrations. Fig. 85 illustrates one of the transplants. At the operation no attempt had been made to suture the remaining portions of the capsule attached to the acetabular cavity over the head of the transplant, yet a new capsule has formed; nor was there any attempt to suture the muscles directly to the transplant, they were only sutured over it. Nevertheless, the examination of the specimen shows that the groups of the single muscles have become attached to the foreign bone in almost normal position. Microscopically, the transplanted bone is dead, but there has been extensive substitution. Here, therefore, much of the homoplastic transplant is really a healed-in foreign body. In this case, success was due to the fact that substitution was ahead of resorption. The transplant allowed good function of the limb.

Fig. 86 is the *x*-ray picturing the fibula transplanted from a monkey.

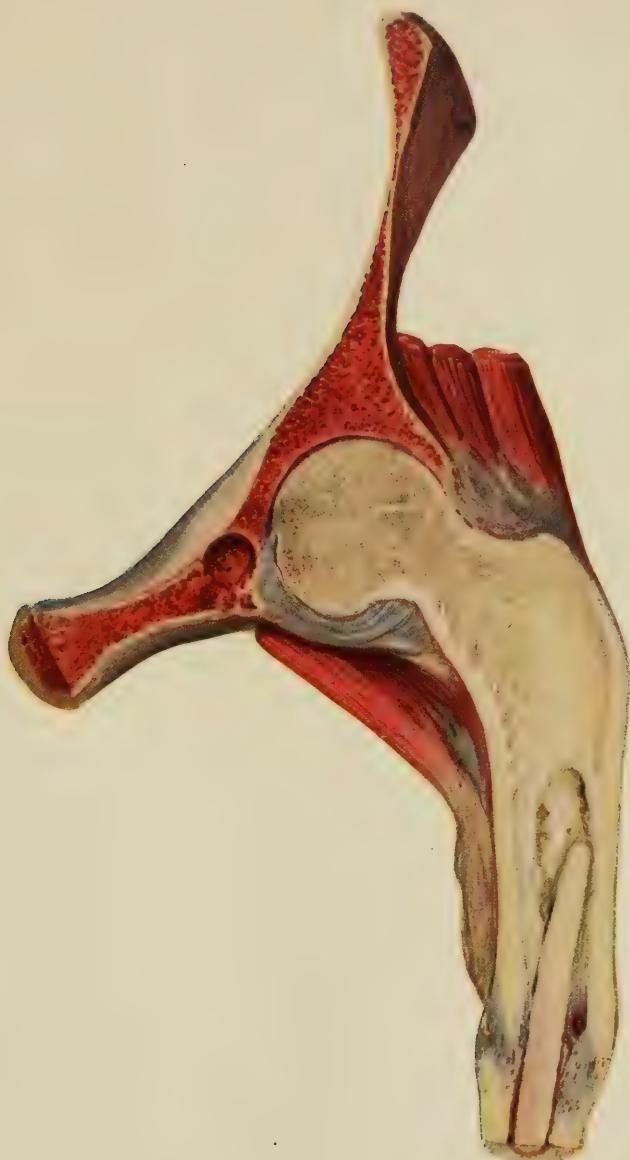
Lexer³ discussed Kuettner's paper in great detail, and mentioned some reports not brought out in his later American paper (*loc. cit.*). He says that the two cases of homoplastic transplantation of Kuettner confirm his own observations. Then he tells of a very remarkable case. Here he transplanted the entire knee-joint from a cadaver. It healed-in, but there was such an excessive connective-tissue reaction about it, that there was no joint motion. So, five months later, he removed this transplant and obtained from an amputation much fresher material, which healed in with good function. This gave Lexer an opportunity

¹ Centralbl. f. Chir., 1913, xl, Supl. 23.

² Archiv f. klin. Chir., 1913, cii, 48.

³ Centralbl. f. Chir., 1913, xl, Supl. 23.

Fig. 85



to study in the gross, and microscopically, the homoplastic transplant which had remained in an aseptic condition five months. In the gross, not only the bone, but also the joint cartilage looked normal, yet the staining properties and histological examination showed death of the tissues. As Lexer states, there are many problems yet to be settled in all three types of transplantation. It may be possible in homo- and heteroplastic transplants to investigate the serum and cell-albumin

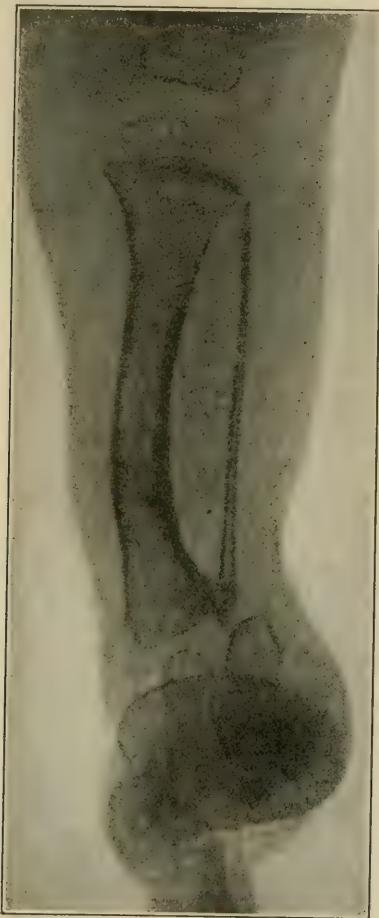


FIG. 86

reactions of the donor and recipient before operation, and perhaps something can be done in preparation through some form of serum reaction. Keysser, in Lexer's clinic, has been working on this line in animal experimentation, but as yet there were not sufficient results to be reported. As Lexer does not mention this in his American paper written a year later, we may conclude that the work is still in progress without definite results.

Lexer also calls attention to the fact that homoplastic transplants from healthy human individuals into patients suffering with tuberculosis or syphilis, are rarely successful, and he suggests that an attempt should be made, if possible, to get material from patients suffering from these diseases.

Mayer and Wehner,¹ from Borst's experimental pathological laboratory, contribute the results of their recent experiments on transplantation of bone and periosteum and what cells in the transplant retain their power of producing new bone. They state that these results contradict MacEwen, and that they have been unable to demonstrate that the mature bone cell in the condensed bone has any power of new bone formation. New bone formation is chiefly produced by the specific cell of the inner layer of the periosteum. The endosteal bone cell in the marrow cavity and Haversian canal is also capable of bone production, provided it is rapidly vascularized from the surrounding tissue in which it is imbedded. For this reason the bone transplant must be split longitudinally. Here we have, then, further experimental evidence confirming clinical experience that, if possible, the periosteum should be removed with the transplant, and where we wish much new bone formation from the endosteal cell, the bone should be divided longitudinally.

Their experiments also prove that the transplanted tissue lives if it is vascularized rapidly enough, and that the young bone cells grow into the cavity of the condensed bone which is being absorbed, and produce new bone there. This therefore confirms Lexer's statement, that if substitution of new bone formation is in advance of bone absorption, the chances of a success are best.

It is also important to note from these experiments that if we strip the periosteum, but leave some of the inner layer of it attached to the bone, we have with the bone transplant viable specific bone cells. This probably explains MacEwen's error.

W. Skatschewski² has demonstrated that in the adult one can resect all but a small portion of the lower end of the fibula for transplantation. If it becomes necessary to remove the entire fibula, some arthrodesis operation should be performed to fix the tibio-astragular joint.

This is a very important point to bear in mind, and, if necessary, both fibulae may be taken as auto- or homoplastic transplants. In the adult, this gives us a piece of bone about 20 to 25 cm. in length. If the two fibulae are taken, we can get sufficient length for even a defect of the entire femur, and, if these bones are split longitudinally, the probabilities are that the resulting bone will be strong enough to bear weight.

THE RIB AS AN AUTOTRANSPLANT. Tschisch³ was compelled to resect the entire clavicle for a central cystic tumor (sarcoma?) with its periosteum. The patient was a girl, aged eighteen. He then removed

¹ Archiv f. klin. Chir., 1914, ciii, 732.

² Centralbl. f. Chir., 1913, xl, 755.

³ Deutsche Zeitschr. f. Chir., 1914, cxxvii, 197.

the eleventh rib with its anterior periosteum, leaving the posterior periosteum adherent to the pleura. With this piece, about 13 cm. in length, there was 2.5 cm. of the cartilage end. After the resection of the clavicle with its periosteum, he sutured the muscles over the exposed



FIG. 87



FIG. 88

vessels and nerves, molded the rib to the shape of the clavicle, placed it on the muscle bed and then sutured muscle, fat and skin. The graft healed in, and, as shown in Figs. 87, 88, 89, and 90, there is no impaired function.



FIG. 89



FIG. 90

McWilliams,¹ of New York, considers in detail the use of a rib as a graft. Among other things he suggests the employment of a rib as a substitute for the Lane plate. McWilliams is of the opinion that the ninth rib is the most accessible.

¹ *Annals of Surgery*, 1912, lvi, 377.

Molineus¹ has employed the spine of the scapula as an autoplasic graft when the clavicle has been partially resected for tumor or other disease.

ENGLISH AND AMERICAN LITERATURE. Both in the American and British journals there have appeared in the past year a number of very interesting and instructive reports on bone transplantation after resection of the bone for disease and tumor, and on methods of transplantation for fracture. It is very difficult to summarize the results in this new field. Successes have been obtained unexpectedly, and failures have occurred without an easily demonstrable reason. On the whole, the results have been good, but there are yet many points which need further experimental and clinical elucidation.

I am confident that the newness of the operation has influenced many good surgeons to resort to resection and transplantation when it was really not necessary to accomplish either a cure of the disease or a better functional result, for example, in bone cysts and *ostitis fibrosa*. On the other hand, it has not been tried as much as it should be for the more malignant tumors. Here amputation is still too frequently performed. Then, again, the work of Nichols² on subperiosteal resection for osteomyelitis has apparently been forgotten.

Clarence A. McWilliams,³ of New York, gives a summary of the views on bone transplantation, and a number of experiments of his own, demonstrating, as I stated before, that there is still considerable difference of opinion.

McWilliams gives, as indication for bone-grafting, seven rules, modified from Murphy's rules:

1. To correct deformities.
2. To produce union in ununited fractures.
3. To replace bone removed by such destructive inflammatory processes as osteomyelitis, tuberculosis and syphilis.
4. To restore or support fragments dislodged or destroyed by fracture.
- 5 and 6. To replace bone removed for benign or malignant disease.
7. To immobilize joints.

He then gives the general principles to be observed in bone transplantation. The wound, and the operation should be aseptic. The bone graft should always have periosteum. If possible, it should be autoplasic. If one must take a homoplastic graft, the donor's blood should be examined for syphilis.

In fractures separating the head of the humerus or femur, with dislocation of the fragment, one need not remove the fragment as was formerly the rule, but the head can be replaced and treated as an autoplasic graft. All foreign, non-absorbable suture material should be avoided, if possible. Chromic gut is preferred. The recent work of

¹ Deutsche Zeitschr. f. Chir., 1913, cxxi, 180.

² Journal of American Medical Association, February 3, 1904.

³ Annals of Surgery, 1914, lix, 465.

Kirschner would indicate that suture material of fascia is better than chromic gut. After transplantation, immobilization is essential for five months. The employment of the Esmarch is contra-indicated, as it predisposes for hematoma.

John Rogers,¹ of New York, reports on the employment of a bone graft to fix the fragments in fractured patella. Fig. 91 is an *x*-ray of such a graft nineteen weeks after insertion. This method is hardly necessary for fresh fracture, but will probably add to the success of the operation in old fracture or in refracture. Henderson,² of the Mayo clinic, gives a method of bone grafting for ununited fracture of the



FIG. 91.—Showing the autogenous bone-graft in position August 1, nineteen weeks after its insertion. There is a perfect functional result.

tibia. Fig. 92 is a clear diagram of the scheme. Robinson,³ of Kansas City, reports 5 cases of ununited fracture of the tibia treated successfully with transplants. Fig. 93 shows the result in Case 3.

George D. Stewart,⁴ of New York, demonstrated, before the New York Surgical Society, the successful result of transplantation for an ununited fracture of the shaft of the humerus. Fig. 94, an *x*-ray taken before operation, shows the defect in the shaft of the humerus. The injury was a compound, comminuted fracture. In the first-aid

¹ Annals of Surgery, 1914, lix, 483.

² *Ibid.*, p. 495.

³ *Ibid.*, p. 486.

⁴ *Ibid.*, p. 763.

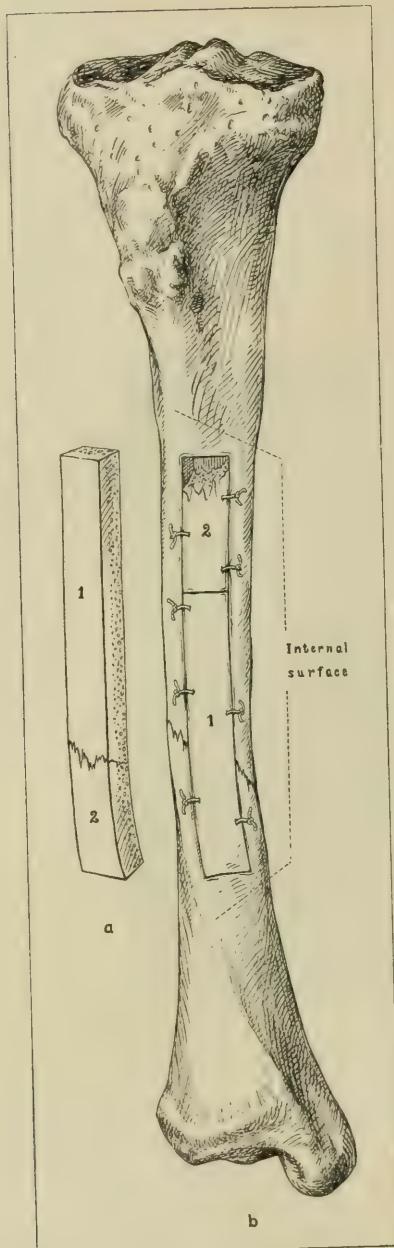


FIG. 92

FIG. 92.—1a shows diagram of transplant removed from the long fragment; 2a, shows transplant removed from the short fragment; 1b, shows inversion of long transplant to bridge fracture; 2b, shows short transplant inserted to fill gap left by removal of transplant from long fragment. Catgut sutures in periosteum of graft and shaft.

FIG. 93.—Bone transplant for ununited fracture of tibia.



FIG. 93

dressing the wound was irrigated with iodine solution and packed with gauze, as there was oozing. Fortunately, there were no injuries of the larger vessels or nerves. Twenty-four hours later the fragments of bone were removed, but, of course, the wound was in no condition for any operation on the bone. The healing of the wound demonstrated this, because there was sloughing of some of the soft parts. The complete healing of the wound was not accomplished until four months had passed. One month later the condition was as shown in Fig. 94. At



FIG. 94.—Limb before transplantation.



FIG. 95.—Limb after transplant.

the operation the sharp ends of the fragments were divided transversely; the transplant was taken from the tibia. The operation was made difficult by scar tissue and contraction. In forcing the transplant in, and lengthening the arm, the musculospiral nerve was accidentally divided and had to be sutured. Also it was difficult to get soft tissue to cover the transplant. The excellent result in bone healing is shown in Fig. 95.

John B. Murphy,¹ of Chicago, summarizes his former publication and

¹ *Surgery, Gynecology, and Obstetrics*, 1913, xvi, 493.

the personal experiences in his clinic, with many illustrations. One will notice that he uses nails, Lane plates, and silver wire in many of the cases, apparently without bad result, although McWilliams cautions against it. Fig. 96 illustrates an autotransplant from the tibia to fill



FIG. 96



FIG. 97

FIG. 96.—After removal of diseased bone, a transplant seven and a half inches in length was removed from the opposite tibia and the lower end was driven into the medullary canal of the humerus fragment and held in place with a small wire nail. The upper end of the transplant was placed in the glenoid cavity and the capsule sutured around it.

FIG. 97.—Skiagram made shortly after operation. The upper end of the transplant is in the acetabulum. The lower end is in the medullary canal of the femur. The lower nail prevents the sliding of the transplant; the upper nail marks the point where the muscles are fixed around the transplant. It was this nail which caused the fracture of the transplant. The small fragment above and to the left is secured to the main fragment by means of phosphor-bronze wire sutures. Regeneration of bone is already taking place.

the defect after the resection of the upper third of the humerus for a benign bone cyst. This patient had good function. Fig. 97 shows a transplant to fill the defect after resecting the upper portion of the femur with its head for chondrosarcoma. Note that the lower end of

the transplant is forced into the marrow cavity of the shaft of the femur and nailed; the upper end is in the acetabular cavity, and here the nail has fractured the transplant. In a case like this it is my opinion that the upper end of the fibula, with its cartilage head, would have made a better transplant. An x -ray of this case one year later (Fig. 98) without doubt demonstrates bone formation and thickening of the ingraft. The fracturing of the upper portion seems to have done no harm. Fig. 99 illustrates the fixation of a graft after resection of the



FIG. 98.—Skiagram taken one year after operation. There is much regeneration of bone, and it is progressing along the transplant. The lower nail is now embedded in the new bone. The tendency to reformation of the upper extremity of the femur is quite apparent.

upper portion of the tibia. Note the two nails and many wires, also the beautiful position of the graft which was just as good one year later (Fig. 100).

In this paper Murphy gives his cases in detail, and every surgeon interested in bone-grafting should read the original.

C. J. Bond¹ reports his experience with transplantation of the fibula and gives x -rays of his early and late results.

BONE CAVITIES. The filling of bone cavities has been a difficult problem for years. In cases of osteomyelitis, circumscribed tuberculosis, syphilitic osteomyelitis, bone cysts and osteitis fibrosa, and the

¹ British Journal of Surgery, 1914, i, 610.

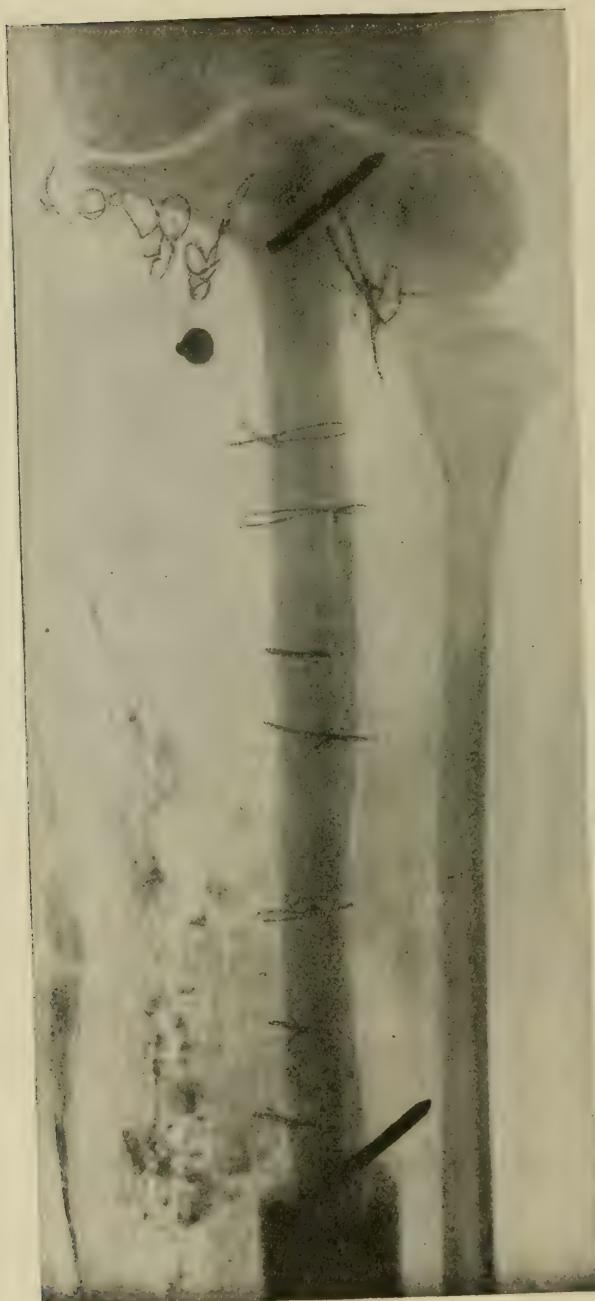


FIG. 99.—Skiagram made two months after the operation, while patient was still wearing a plaster cast. Bone regeneration is already taking place, as is evidenced by the shadow along the right-hand side of the transplant. The nails above and below secure the fixation of the transplant and prevent its displacement. The phosphor-bronze wire sutures were used to approximate the deeper layers of the wound. The small foreign body to the left and below the upper nail is not a part of the picture.

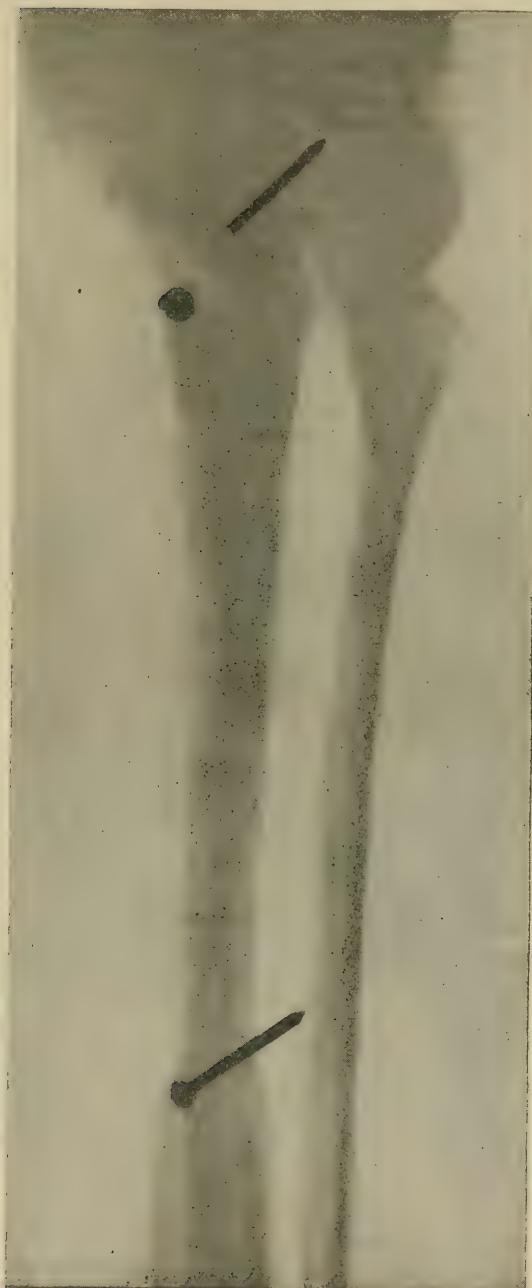


FIG. 100.—This skiagram was made about a year after the operation and shows to what extent bone regeneration has taken place. The transplant is no longer in evidence. The new bone is rapidly taking on the size and shape of the old bone.

now well-known and sharply differentiated giant-cell tumor—in all of these a cavity varying in size and shape remains in the bone after the disease has been thoroughly removed. Before the days of bone transplantation there were many efforts and many methods which had for their object the hastening of the filling of this bone cavity by methods of open wound treatment, or the filling of the cavity at the time of the operation followed by closure of the skin. Perhaps Schede was the first to attempt the closed method with his blood-clot. Then there followed different substances of the type of pastes. Later, in 1904, Nichols, of Boston, concluded that the healing of these cavities was so uncertain and prolonged that, at least in chronic osteomyelitis, it was justifiable to completely remove the involved bone by subperiosteal resection and wait for the periosteum to form new bone. There have been successes with all methods, probably Nichols' method—the most formidable—has given the largest percentage of good results. In aseptic cases the failure has been due to the difficulty of checking hemorrhage, and after Schede's method some patients died of hemorrhage. In other cases, in which pyogenic organisms were present, as in osteomyelitis, or where there were external fistulæ, the results have been marred by suppuration of the wound, and, again, in tuberculosis by recurrence of the disease due to incomplete removal.

Now that the method of bone transplantation has been established, we will have to deal less frequently with the problem of the filling of bone cavities, in order to obtain primary healing. Nevertheless, I am confident that there will still be cases where complete resection and transplantation of bone should not be done, namely, when simpler methods offer as good success, and when complete resection would jeopardize the function of an uninvolved joint. This, I am sure, will be the case in most instances of bone cysts and *ostitis fibrosa*, in medullary giant-cell tumors which can be removed with the curette, and in sharply circumscribed osteomyelitis, tuberculosis and syphilis. For the filling of such cavities we have, in recent literature, the revival of the pedunculated muscle flap.¹

But in some cases the filling of a bone cavity with a muscle flap is difficult and not infrequently accomplished at the loss of function, and now this method seems no better than that devised by Makkas,² in 1912. After experimenting with animals in which he filled bone cavities with fat, he applied it with success to the filling of cavities in human patients with equal success. The fat (autoplastic free transplant) fills the cavity, in places it is replaced by connective tissue, and bone lamellæ grow into the fat, but whether the entire fat becomes completely ossified, Makkas was unable to state at the time of his report, either from his

¹ Sawicky, Centralbl. f. Chir., 1913, xl, 930; and Richard Levy, Beitr. z. Chir., 1914, xci, 666.

² Beitr. z. klin. Chir., 1912, lxxvii, 523.

animal experiments or clinical experience. Fig. 101 is a specimen from an animal ninety-one days after the introduction of the fat into a small



FIG. 101

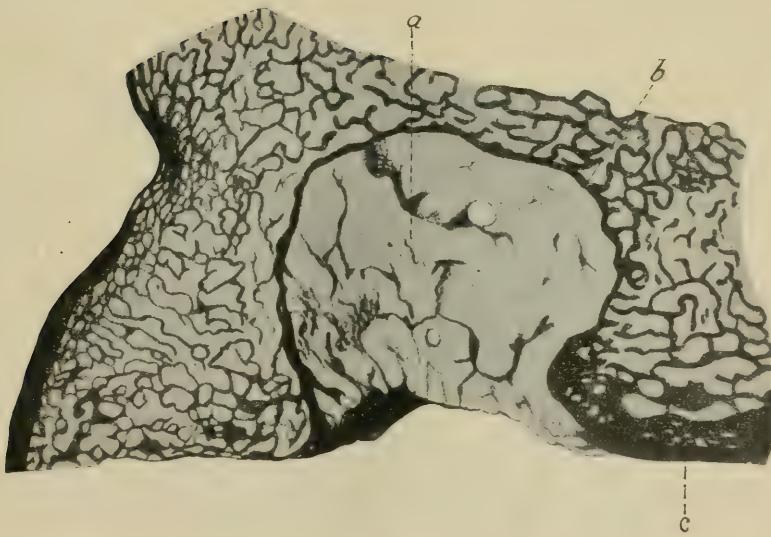


FIG. 102

bone cavity. It has completely healed in. Fig. 102 is a microscopic section: *a*, the fat showing some ingrowth of bone lamellæ; *b*, new bone circumscribing the fat transplant, and *c*, the cortical layer.

Among his clinical cases the one illustrated in Fig. 103 is most interesting. This is a diagram showing the area of fat transplanted into cavities of the femur and tibia left after removal of tubercular foci. The patient was a child, aged five years, and the lesion was tuberculosis of the knee with extensive destruction. The result, at the end of two months, was excellent—the wound had healed *per primam*, and the *x*-rays showed beginning ossification of the fat, but, of course, we do not know the ultimate result.

Max Krabbel,¹ from the same clinic as Makkas, Garré's, in Bonn, makes a report on 10 cases with five perfect results, among these there is 1 case of giant-cell tumor of the os calcis, 2 cases of tuberculosis, and 1 of chronic osteomyelitis. In this latter case there were no fistulae.

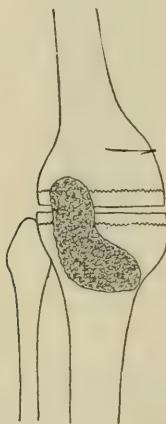


FIG. 103

Of the five failures, three were chronic osteomyelitis with fistulae in which the wound did not heal *per primam*, and two of tuberculosis in which there was a recurrence of the disease.

One of the most interesting cases reported is shown in Fig. 104—an *x*-ray of a focus in the os calcis. The patient was a girl, aged sixteen years, who had had pain in the heel for six months; at the examination there was slight swelling, but no change of function in the joint. At the operation, after passing through normal periosteum and bone, a focus of soft, hemorrhagic tissue was encountered. This was thoroughly curetted, the cavity filled with the fat transplant and the wound closed by accurate suture. Fig. 105 is an *x*-ray one year later and shows that the fat has been almost replaced by bone.

The third report is by Eugen Klopfer² on 8 cases. In 2 only did the wound heal *per primam*, and these were both aseptic cases, but in 6

¹ Beitr. z. klin. Chir., 1913, lxxxv, 400.

² Ibid., lxxxiv, 499.

cases of chronic osteomyelitis with fistulæ, the wounds did not heal *per primam*. In spite of this, however, much of the transplanted fat



FIG. 104

lived, and Klopfer was of the opinion that the filling of the cavity with fat shortened the usual long convalescence. The autoplastic free transplant should be taken from the anterior lateral surfaces of the thigh or from the gluteal region. In infected cases or in those with fistulæ, when



FIG. 105

the surgeon operates on the fat, he should employ fresh instruments and gloves. Makkas and Krabbel are of the opinion that pieces of

fat larger than a hen's egg are less apt to be successful, while Klopfer, in one case, transplanted a piece of fat 20 by 4 cm. Makkas and Krabbel emphasize the importance of checking the hemorrhage and removing the Esomach, if it is used, before inserting the transplant, while Klopfer is of the opinion that if the bone cavity is completely filled with the fat, it will have a hemostatic effect on oozing surfaces and bleeding from smaller vessels. None of these writers give any special directions for cleansing the septic cavities in osteomyelitis and tuberculosis. Practically all the operations in aseptic cases succeeded, while in chronic osteomyelitis with fistulae it usually failed. In the larger number of cases of tuberculosis, the wounds healed *per primam*.

It seems to me that we have here the first contribution of real value on the filling of bone cavities since Schede's work. In many cases it is a much simpler procedure to fill the cavity with fat than to transplant bone. I have successfully used a bone transplant in a bone cyst.

In the majority of these cases of bone cavities, the bone remaining about the cavity is sufficient for function, or weight-bearing. The object of filling the cavity is to hasten the healing of the wound. Time and space forbid a further discussion, but I believe that if fat transplantation for bone cavities proves as successful as bone transplantation for complete bone defects, our methods of treating tuberculosis, osteomyelitis and the benign and less malignant bone tumors will be tremendously improved in the sense of preserving function and shortening the healing process.

Harry M. Sherman¹ reports on his experience with filling cavities both in bone and soft tissue with normal salt solution, but his cases are not of a character or sufficient in number to prove his point, interesting as it is. For example, he reports a bone cyst of the humerus which healed after filling of the cavity with salt solution. Many cases have healed after not filling the cavity with anything, at least deliberately. Nevertheless, this suggestion should be carefully borne in mind.

BONE CYSTS. Among the large recent literature on bone cysts and osteitis fibrosa I would like to call attention to the recent beautifully illustrated article by R. C. Elmslie of London.²

¹ Surgery, Gynecology, and Obstetrics, 1911, xiii, 147.

² British Journal of Surgery, 1914, ii, 17.

PRACTICAL THERAPEUTIC REFERENDUM.

BY H. R. M. LANDIS, M.D.

Alcohol. There is probably no medicinal agent about which there is so much diversity of opinion as alcohol. At one time it was widely employed in a variety of conditions, but of recent years its use is becoming more and more restricted. Among the varied conditions for which alcohol has been prescribed are the following: As an hypnotic, as an antifebrile agent, as a food, as a stomachic, as a stimulant, and as an agent for increasing resistance to bacterial infections.

Ewald,¹ in a contribution on the use of *alcohol in infectious diseases*, states that he has dropped the use of alcohol almost entirely in his medical work. He asserts that the drug is absolutely useless in either the acute or chronic infections from the stand-point of reducing the temperature, destroying bacteria, or as an hypnotic. So far from increasing the resistance to bacterial infection, Ewald believes that alcohol increases the susceptibility to the infectious diseases. He offers as a proof of this contention that habitual users of alcohol are attacked by acute infectious diseases as often, and as severely, as those who do not use alcohol, and, furthermore, that this class of individuals prove less resistant than the teetotaler. In addition, he cites statistics from an insurance company which show that pneumonia occurred ten times as often among hard drinkers as among the other policy holders, and was fatal in like proportion. Acute articular rheumatism, and other infectious diseases occurred nearly twice as often, and he states that some English statistics show nearly twice as many cancers among drinkers as among non-drinkers.

Ewald is of the opinion that alcohol can be dispensed with as a stomachic, and that much better results can be obtained from the use of dilute hydrochloric acid and pepsin or bitter infusions. He does admit, however, that the judicious use of alcohol to give flavor to a meal is sometimes advisable.

In regard to its use as a stimulant, Ewald admits that it is often useful, and has the advantage of always being accessible in convenient form.

There can be no doubt that the position Ewald has taken regarding the medicinal use of alcohol will be indorsed by many physicians. On the other hand, it is not to be lost sight of that alcohol has for many years been regarded as one of our best remedies in combating severe

¹ Medizinische Klinik, August 3, 1913.

acute infections. And while convincing proof, from an experimental stand-point, may be wanting to prove its value in these conditions, there is a mass of favorable testimony furnished by skilled and experienced clinicians. Furthermore, to contrast the confirmed drunkard, whose resistance has been lowered by excesses, with the teetotaler or moderate user, is hardly a fair comparison.

Holitscher¹ sent out a questionnaire to a large number of sanatoria requesting information in regard to *tuberculosis*, and the drinking of spirituous liquors in the individual case, and in the recent and remote family history. In answer to his appeal, he received a total of three thousand filled-out blanks. An analysis of these answers showed that the tuberculous do not become hard drinkers as a rule, but that persons addicted to alcohol are particularly liable to contract tuberculosis.

The use of alcohol in the treatment of tuberculosis varies in different localities. Thus, in many of the foreign sanatoria, alcohol in the form of table wines is fully used. It is quite likely, however, that the use of the alcohol under these circumstances is simply a continuance of the ordinary method of living. In this country, the use of alcohol has been abandoned almost entirely in the treatment of tuberculosis, although in former years its use was pretty general. The popularity enjoyed by alcohol in the treatment of tuberculosis was due in large measure to the influence of Austin Flint, who employed it routinely and in large amounts. Flint asserted that in his large experience he never encountered an instance of chronic alcoholism resulting from this treatment.

While I employ alcohol very sparingly in the management of tuberculous patients, I do, occasionally, use it.

Raff² made a series of observations on the *blood-pressure in chronic alcoholics* with normal heart and kidneys, after abstinence had been enforced in the hospital. Raff found that for a few days there was a marked rise in the systolic pressure, and then a gradual fall. The diastolic pressure was constantly high throughout the whole period, so that the increased pulse pressure was caused only by the rise in the diastolic pressure. Raff states that this peculiarity in the blood-pressure curve is so constant that it is valuable for diagnostic purposes in doubtful cases.

In an experimental study of the gastro-intestinal absorption of drugs, Hanzlik and Collins³ found that the quantitative absorption of alcohol from the gastro-intestinal tracts of cats and dogs is practically identical. The extent of the absorbing area does not markedly influence the intestinal absorption of alcohol, nor does the degree of concentration, although a 10 per cent. solution is absorbed somewhat better than 5, 50, or 95 per cent. solutions. Absorption of the drug from the intestines prac-

¹ Beiträge zur Klinik der Tuberculose, vol. xxix, No. 2.

² Deutsche Archiv f. klinische Medizin, vol. cxii, No. 3.

³ Journal Pharmacology and Experimental Therapeutics, November, 1913.

tically ceases at the end of half an hour. The inhibitory effect is of a local nature, since the presence of alcohol in one loop of the intestine does not inhibit absorption from adjoining loops. Under certain conditions, the inhibition may occur systemically, as, for instance, the intravenous injection of the drug. The percentage absorption of alcohol remains practically constant within wide variations of the systemic blood-pressure, but changes in the local circulation influence the intestinal absorption. Injury to the intestinal mucosa likewise lessens the absorption of alcohol.

In an experience of fourteen years, Breitmann¹ states that he has found nothing superior to 60 or 70 per cent. *alcohol in the treatment of burns* of the first and second degrees. The burned area can be placed in a pan containing the alcohol or treated with compresses moistened with alcohol. The pain is relieved, the inflammation subsides, the blisters regress, and a dry scab forms. Healing leaves no trace of the burn. The shorter the interval between the occurrence of the burn and the application of the alcohol, the better the result. As the burned area has been sterilized by the heat, the alcohol, if applied at once, before any germs from without reach the area, dehydrates, dries and tans the tissues, and under the tanned surface the tissues heal aseptically. There is no smarting from the alcohol unless the blisters have opened. The treatment is entirely too painful for burns of the third degree.

Antidiphtheritic Serum. Park,² who has on several occasions advocated a single large dose of *antitoxin in the treatment of diphtheria*, has published another article on the subject, in which he adduces further arguments in favor of its adoption. He has shown experimentally that, in animals, a single dose administered after infection has proved efficacious when the same and even larger quantities, in divided doses, failed to save the animal's life. He also cited cases treated with one dose in which the antitoxin content of the blood was tested from hour to hour, showing a progressive increase for the first three days. The apparent improvement following a second dose of antitoxin, he believes, is attributed partly to the continued absorption of the first injection and partly to the necessary time required for recovery in the local process. When the first dose is of adequate size, a second one produces no real additional effect.

In confirmation of his views, Park cites the clinical results obtained at the Williard Parker Hospital. During the past year over 95 per cent. of all cases of diphtheria treated there received but one injection of antitoxin, and the records show that the mortality from the disease has been the lowest in the history of the institution. The following dosage

¹ Therapeutische Monatschrift, December, 1913.

² Boston Medical and Surgical Journal, December, 1913.

was given: 5000 units for the mild cases; 10,000 or more for the moderately severe, and 20,000 units for the malignant cases. In the latter class of cases, the antitoxin was administered intravenously whenever possible. In Park's opinion, a given number of units given intravenously has four times the potency that it has when injected subcutaneously.

Woody¹ strongly advocates a large initial dose, and repeats it if necessary. In his opinion, no case, however mild, should receive less than 10,000 units. If both tonsils are well covered with the exudate and of one or two days' duration, the initial dose should be 40,000 units; the dose should be increased to 75,000 or 150,000 units if, with the same involvement, the disease has existed for three or more days. Extension of the exudate to tissues adjoining the tonsils requires a dose of from 150,000 to 300,000 units. The usual teaching has been that, for nasal and laryngeal cases, the dosage should be much greater than for the tonsillar cases. Woody, however, advises for this type of case 20,000 to 45,000 units; if associated with marked symptoms of toxemia, the dose should be increased to 150,000 units.

The advantage of a large single dose is that it does away with the period of anxious waiting to determine whether or not a result has been achieved. Furthermore, in addition to the local improvement, there is a marked improvement in the patient's general condition, and late complications are lessened in frequency and severity. The rapid cures that result from the use of large doses are real and not apparent.

S. G. Wilson² is another advocate of a large initial dose, which, in his opinion, should be not less than 10,000 units.

Park³ has advocated for some time the *intravenous administration of antitoxin* in severe, desperate cases. As has been already alluded to, he believes that a given quantity of antitoxin given in this way is four times as potent as when injected subcutaneously. Beyer⁴ has made a comparative study of the intravenous and subcutaneous methods. He found that, in cases in which the injections were made on the second day of the illness, the average of defervescence was in favor of the intravenous treatment. The standard of defervescence was taken as the day on which the temperature was definitely normal. Five intravenous cases showed a normal temperature on the first day after injection, as against none of the subcutaneous cases. Taking the first two days together, eleven intravenous and but five subcutaneous ones yielded to treatment.

As the days increase, the conditions are reversed, and on the third day favorable results were noted in only three of the intravenous, and in six

¹ Pennsylvania Medical Journal, February, 1914.

² New Orleans Medical and Surgical Journal, September, 1913.

³ Loc. cit.

⁴ Münchener med. Wochenschrift, August 26, 1913.

of the subcutaneous cases. On and after the fourth day, all the intravenous cases gave normal temperatures, but not all of the subcutaneous ones.

In experiments on an equal number of intravenous and subcutaneous injections, the figures were again in favor of the intravenous method. In the greater number the shedding of the membrane and the shriveling of the ulcers took place within four days after treatment.

Within the first two days after treatment the pharynx was clear in five of the intravenous and only two of the subcutaneous ones. Taking the first three days together, the figures were thirteen and seven respectively, while on the fourth day the conditions were reversed.

Beyer points out that intravenous cases were frequently seen in which the day after injection the swelling of the pharynx increased visibly and the membrane spread superficially toward the soft palate. Taking all things into consideration the impression was gained that, so far as the pharynx is concerned, the two methods do not greatly differ.

Mixsell¹ believes that while the intravenous method is safe when done with skill and care, it is not easy of performance in young children. In his opinion, the method is not often available in private practice and should not be done except under the very best of conditions. His experience, in a study of 158 cases, showed so little difference between the intravenous and subcutaneous methods that he does not think we are warranted in asserting that one method is superior to the other.

Given subcutaneously, Mixsell recommends a large initial dose of the antitoxin.

Rolleston and Macleod² advocate *intramuscular injections* of diphtheria antitoxin, the method employed in Schlossmann's Clinic at Düsseldorf. They report on results obtained in two hundred patients whose ages ranged from two weeks to thirty-four years. In severe faucial cases the dose was from 16,000 to 20,000 units on admission, the same, but sometimes a smaller dose, was repeated, if necessary, on one or two of the following days. Moderate faucial cases received from 8,000 to 12,000 units on admission, this being repeated if necessary. Mild faucial cases received from 4,000 to 8,000 units and it was rarely necessary to repeat this. Cases with nasal, laryngeal or conjunctival involvement, but no disease in the throat, received from 4,000 to 12,000 units.

The average dose for the two hundred patients was 12,250 units, ranging from 4000 units to thirty-three patients, to 44,000 to one patient; seventy-one received 8000 units.

The intramuscular injection is made as follows: Without preliminary washing, the outer side of the thigh in its middle third is painted with a 2 per cent. solution of iodine. The needle is then driven deep into

¹ California State Journal of Medicine, August, 1913.

² Metropolitan Asylums Board's Annual Report, 1913.

the body of the vastus externus, and the injection given in the ordinary way. This can be done even in small children. The maximum amount administered in this way was 20,000 units (50 c.c.). There was no instance of abscess formation.

Rolleston and MacLeod believe that intramuscular injection, preferably in the vastus externus, deserves to supersede all other methods of administration of antitoxin in the treatment of diphtheria for the following reasons:

1. It is quite as simple as the subcutaneous method, ensures much more rapid absorption, is less painful and less liable to give rise to abscesses at the injection site.

2. It is superior to the intravenous method, not only in the greater simplicity of its technique, but also in the less rapid excretion of antitoxin after injection.

3. The more rapid absorption of antitoxin by the intramuscular route is shown not by the effect on the faucial or laryngeal process, but by the lesser incidence of paralysis, especially of a severe kind.

Summing up the evidence now before us, it would seem that the best method to follow in the administration of the antitoxin is that recommended by Park, namely, for mild cases not less than 5000 units; for severe cases 10,000 units or more, and for the severe and malignant cases, 20,000 units. All the evidence points to the fact that there is no danger from large doses. If, therefore, one is in doubt as to whether a given case requires 5000 or 10,000 units the latter should always be selected. In the desperately ill cases, the intravenous or intramuscular method of administering the antitoxin should be considered.

PROPHYLACTIC USE OF ANTITOXIN. Braun¹ gave prophylactic injections to 2218 children who had been exposed to the disease through another member of the family. As a result of these injections, only 1.62 per cent. developed diphtheria, of which four died. Nearly 35 per cent. of children not receiving a prophylactic injection developed the disease after exposure.

It has been generally accepted that the immunity conferred by diphtheria antitoxin is relatively brief in duration. Braun believes, from his experience, however, that the immunity lasts for a long time, possibly years. He never experienced anything suggesting anaphylaxis even on reinjection of the serum, except a skin eruption in two cases, and in one of these it was the first time any serum had been injected.

TREATMENT OF DIPHTHERIA "CARRIERS." It has been recognized for some time that there are individuals who carry virulent diphtheria bacilli in their throats, and who are, for this reason, a menace to the public health. In some instances, the "carrier" has never manifested any clinical evidence of the disease; in others, there is a persistence of the germ in the throat for varying periods after recovery from the disease.

¹ Deutsche med. Wochenschrift, May 28, 1914.

It is this latter group which is apt to cause the practitioner and boards of health much trouble and annoyance. The family of the patient strenuously objects to the continued isolation when all danger has passed, and there is no apparent evidence of disease. The continuance of the quarantine for a week or so under these circumstances is often a difficult and disagreeable duty; and when, as sometimes happens, the isolation of the patient has to be maintained for several months, it becomes a serious matter. Still another consideration is the question of bed space in hospitals, as serious congestion occurs at times because of the long stay of patients whose throats still harbor the bacilli.

I recall one case in which an adult patient was kept isolated for nearly three months before the requirements of the Board of Health could be satisfied, namely, three successive negative cultures from the throat. In this instance, two successive negative cultures were obtained a number of times, only to be succeeded by a positive one.

It is highly desirable that some method be devised which will quickly rid the patient of the offending germs, not only because the continued isolation is a serious matter for the patient, but also because the "carrier" is a distinct menace to the public health. During the past year several methods have been recommended.

Albert¹ has contributed a very interesting article on this subject. In his experience, 41 per cent. were free from the bacilli by the end of the second week after the beginning of the disease; 73 per cent. at the end of the third week, and 99 per cent. at the end of the fourth week. He states that, of the general population who have not been affected by the disease, 1 or 2 per cent. under ordinary conditions, and from 5 to 10 per cent. during epidemics, are "carriers" of the germs. They retain the bacilli for about the same length of time, on an average, as convalescents from the disease.

The virulence of the diphtheria bacilli seems to be but slightly lessened during the "carrier" condition even though the condition persists for a long time, and is completely lost in only a small proportion of the cases. As Albert states, it is, therefore, quite obvious that with but few exceptions a "carrier" can transmit the disease as long as the "carrier" condition remains. It is also probable that the "carriers" are responsible for more cases of diphtheria than those affected by the disease itself. This certainly seems to be the case if we include among the "carriers" those with slight evidence of local inflammation, but presenting no obvious general symptoms, and whose condition is not diagnosed clinically as diphtheria.

In Albert's opinion it is not so much the surface of the tonsils but the crypts of these organs, which are most apt to harbor the germs, and unless the culture is taken from the latter places, negative cultures may

¹ Journal American Medical Association, September 27, 1913.

readily be obtained. He states that those who have had the most extensive experience with diphtheria bacilli carriers have reported that a large proportion of them have enlarged tonsils with prominent crypt openings and deep crypts.

The following methods have been used to rid the throat of the bacilli: Liquid antiseptics applied with cotton, sprayed, or gargled; inhalations of antiseptic vapors; use of diphtheria vaccine, toxin, antitoxic and anti-bacillary serum, toxins of the *Bacillus pyocyaneus*, and, finally, the use of cultures of staphylococci.

Albert strongly recommends the use of *silver nitrate*, which was first introduced for this purpose by Dr. L. W. Dean, of Iowa City:

"A 5 or 10 per cent. solution is used and should be made up with distilled water and kept in a dark colored bottle or a dark place to prevent deterioration. This solution is applied by means of applicators made of a metal which may be bent readily, such as copper, and are long enough (about 11 inches) to admit of convenient handling. The end which is to be inserted into the crypts must be small (about 0.75 mm. in diameter) and roughened in order to hold cotton. Around this end is tightly wrapped a very small amount of cotton—only a few fibers, so that the cotton-wrapped applicator measures less than a millimeter in diameter. This is bent about a centimeter from the end so that the angle formed is a little more than 90 degrees. It is then dipped in the silver nitrate solution. All excess of the solution should, however, be removed by pressing the cotton against the inner side of the neck of the bottle. This is important, since the excess may trickle down the throat to the glottis of the larynx, where the reaction induced may prove serious. With the tongue well pressed down, the crypts should be probed, preferably from below upward, since the slight amount of silver nitrate which may not enter the crypt tends to flow down and the whitening produced tends to obscure the openings of crypts below. The openings of the larger and therefore most important crypts are easily found and entered. To find the smaller ones it is often necessary to run the end of the applicator gently over the surface of the tonsil until it finds a depression. Several of the smaller ones may be probed without redipping the applicator into the nitrate solution. For the larger ones, it is best to redip each time. If the cotton-wound probe is too thick it will not readily enter the crypts. In that case, the applicator without the cotton will often pass in easily. Without the cotton, however, it is impossible to introduce sufficient of the nitrate solution, unless possibly the applicator is sufficiently roughened just back of the tip to "hold" a little fluid."

The silver nitrate solution, if thoroughly applied, will destroy the lining epithelium of the crypts. If not thoroughly applied, the deeper epithelial cells are not destroyed. In any case, there is an inflammatory reaction, the degree depending on the strength and amount of the

solution. Albert states that while stronger solutions produce more destruction of tissue, yet the reaction is often too severe. In his opinion, the 5 and 10 per cent. solutions are much preferable.

As the result of his experience with this remedy, Albert is convinced that the application of a solution of silver nitrate to the crypts of the tonsils is efficacious in ridding diphtheria carriers of specific microorganisms. In his opinion, it is the best single remedy we have.

Recently it has been advised to spray the throat with a solution containing *staphylococci*. Womer¹ states that while the use of the staphylococci for this purpose causes no unpleasant symptoms there was no appreciable shortening of the period of quarantine. Another drawback, in his opinion, is the fact that the preparation and distribution of the spray entails a large amount of work. Albert² used the staphylococci in two cases. The first one responded beautifully, the bacilli disappearing in a few days. The second one also cleared readily of the diphtheria bacilli, but the local inflammatory reaction associated with nausea, chills, high fever and rapid pulse was so great that he has had no desire to repeat the method. Severe tonsillitis has also followed the use of the streptococcus spray. One such instance was reported last year by Clara W. Davis.³

Strauch⁴ recommends the local use of *tincture of iodine* in order to rid the throat of diphtheria bacilli. No harm or by-effects were noted, except the disagreeable but transient taste of the iodine in the mouth. Strauch reports that, in 16 out of 50 cases, the bacilli disappeared after one application; in 20 others none could be found after three applications; in 2, four applications were necessary, while, in 2 more, bacilli could still be obtained.

Abel⁵ also recommends iodine, but in the form of a vapor. The vapor is obtained by heating iodoform in a flask with two bent glass tubes through a rubber stopper, one tube being connected with a rubber bulb, and the other with a narrow rubber tube. When the flask fills up with the iodine fumes as the iodoform is heated over an alcohol lamp, the fumes are blown into the nostrils and pharynx. This is done twice daily for three days. Abel has treated in this way 89 patients who showed bacilli in their throats longer than three weeks after recovery from diphtheria. In 47 per cent, the bacilli had disappeared after a three days' course of treatment; 31.5 per cent. required two courses, and 20 per cent. three courses of three days each. Only 2 of the 89 failed to respond to the treatment.

The method devised by H. R. Miller⁶ consists in spraying the throat with a warm or almost hot solution of the usual 40 per cent. *formaldehyde*.

¹ Journal American Medical Association, December 27, 1913.

² Loc. cit.

³ Journal American Medical Association, Aug. 9, 1913.

⁴ Therapie der Gegenwart, September, 1913.

⁵ Ibid., December, 1913.

⁶ Medical Record, July 25, 1914.

solution in strengths of from 0.25 to 1 per cent. The spray is used every three or four hours, except during sleep, and should be done one hour before and at least two hours after the ingestion of food. The solution should be prepared fresh each day.

Miller advises that the treatment start with a solution of 0.25 to 0.5 per cent. and later be increased up to 1 per cent. When the higher solutions are employed, the intervals between the spraying should be longer.

Although he has never observed any evidence of kidney irritation, Miller advises that the urine be examined daily.

Wilson¹ recommends segregation, the exposure of the "carrier" to sunshine and vaccine therapy.

Finally there is to be mentioned the use of a *spray of lactic acid bacilli* recommended by Nicholson and Hogan.² These observers report 9 unselected cases in which the results obtained with lactic acid bacilli were most satisfactory. In 4 cases, a pure culture of lactic acid bacilli was sprayed into the nose and throat; in 5, ordinary sour milk was used as a gargle for the throat, and the spray for the nose. Cultures of the live lactic acid bacilli (Bulgarian type) were obtained from one of the large drug houses in 20 c.c. tubes.

The spray was used once daily (one or two 20 c.c. tubes) until the throat cultures were negative. The sour-milk gargle was given every two or three hours. The cultures from the throat became negative in from three to five days.

Nicholson and Hogan state that before a definite conclusion can be reached in regard to the effect that lactic acid bacilli have on the diphtheria bacilli, and the cause of the antagonism between the organisms, however, a large series of cases must be studied, a series that extends over a long period of time, in which comparisons can be made with the former methods of treatment.

Antipneumococcal Serum. Williams³ reports 23 cases of *pneumonia* treated with antipneumococcal serum, with 16 recoveries and 7 deaths, a mortality of 30.5 per cent. Of the 7 patients who died, 3 were alcoholics, 1 of whom had suffered from two previous attacks of pneumonia, and all were very actively delirious. A fourth death occurred in a baby with serious complications. The remaining deaths seemed to have been due to the intensity of the infection.

Of the 16 patients who recovered, 8 had defervescence by crisis and 8 by lysis.

The series offered an opportunity to observe the effects of the administration of large and frequent doses of horse serum that had not been refined in any manner, and that contained no preservative except a trace of chloroform. As a rule, no immediate effects could be detected,

¹ New Orleans Medical and Surgical Journal, September, 1913.

² Journal American Medical Association, February 14, 1914.

³ Archives of Internal Medicine, June, 1914.

and the injection of the serum was tolerated surprisingly well. In 5 patients, however, symptoms of serum intolerance did appear.

The serum employed by Williams was taken from a horse immunized against many strains of pneumococci. Usually it was injected directly into one of the veins of the arm at a temperature about that of the patient's. The serum was given subcutaneously in two children owing to the difficulty of entering a vein, and in four adults the second and later doses were given subcutaneously.

The first dose for adults in the earlier cases was 100 c.c. Later this was increased to as high as 300 c.c. Many of the patients received more than one dose, so that the total amount of serum ranged from 50 to 750 c.c. This maximal quantity was given in six doses spread over a period of five days.

Antistreptococcic Serum. The use of this serum in streptococcic infections is to some extent still on trial, although as time goes on its place is becoming more and more secure. Burnham¹ has recently published a paper in which he reports 111 consecutive cases of severe infection collected from the records of the Presbyterian Hospital of New York City. These cases were either those in which the course and symptoms indicated septicemia, or cultures showed the presence of bacteria in the circulating blood. The cases included in Burnham's report were admitted to the hospital during the period 1905 to 1913. During the early part of this period, vaccines were never used, and serum only occasionally, and it was not until 1907 that the facilities of the hospitals permitted of systematic open-air treatment.

Burnham grouped the cases in accordance with their etiology, namely, those following abortion or labor, those with infected wounds or abscesses, those associated with osteomyelitis and arthritis, those with malignant endocarditis, and, lastly, a miscellaneous group.

The final mortality for the 111 cases was 74, or 66.6 per cent. It is to be borne in mind that this high mortality is in a measure explainable on the ground that they were severe cases treated in a hospital after home treatment had failed.

The mortality of the cases following abortion and labor, 50 cases in all, was 54 per cent. In 22 of these, the blood-cultures were positive, the majority showing streptococci in pure culture; 2 were due to the *Bacillus aerogenes capsulatus*; 2 were due to staphylococci, and the remainder were examples of streptococcic bacteremia. In the puerperal cases, peritonitis was the usual complication.

Antistreptococcic serum or vaccines, or, in some cases, a combination of both, were administered in 17 cases, with 11 recoveries and 6 deaths, a mortality of 35 per cent. as compared with a mortality of 68 per cent. for the remaining cases.

A large percentage of the cases of *puerperal sepsis* are due to the strep-

¹ Annals of Surgery, May, 1914.

tococcus. As the antistreptococcal serum is bactericidal, it should be used early. If its administration is delayed until the bacteriological examination is made, much valuable time is lost and good results cannot be expected. It is, therefore, wise to administer the serum at once without waiting for the bacteriological report. Burnham states that the best results were obtained in those cases in which the serum was used early, and followed by an autogenous vaccine. While the autogenous vaccines are the best, a stock vaccine is advised during the interval in which the autogenous vaccine is being prepared.

Of the 20 cases following *infected wounds and abscesses*, the general mortality was 75 per cent. There were 14 cases of positive blood-cultures, with 3 recoveries and 11 deaths (88 per cent.), 4 of which received vaccines, with a mortality of only 25 per cent. The mortality of those not treated with serum or vaccine was 100 per cent. Two cases received vaccines in combination with antistreptococcal serum, one of which recovered; 1 case recovered with autogenous streptococcal vaccines, and 1 recovered under treatment with stock staphylococcal vaccine.

There were 9 cases following *osteomyelitis* and *arthritis*. Vaccines were used in 4 cases of staphylococcal bacteremia, with 2 recoveries and 2 deaths. The only cases which recovered were those receiving vaccines. There were 16 cases associated with endocarditis and pericarditis, all showing positive blood-cultures, and all ending fatally. Neither vaccines or serum produced any favorable results.

Burnham points out that antistreptococcal serum loses its complement after it has been kept for some time. Therefore, when fresh serum is not obtainable, a certain amount of fresh horse serum should be added to each dose. Fresh horse-serum complement is said to be better adapted to antistreptococcal serum than is human complement.

Burnham states that although septicemia, with true bacteremia, is a disease of exceedingly high mortality, especially when associated with malignant endocarditis and terminal infections, it is nevertheless, in many cases, amenable to treatment.

Antistreptococcal serum is of great value, especially during the early stage when its bactericidal powers are most pronounced, and, if given in sufficient dosage during the period of invasion, will often change a systemic bacteremia into a localized infection. The combination of serum with autogenous vaccines, used as soon as they can be prepared from blood-cultures, seems to be particularly beneficial. If the blood-cultures are sterile, a vaccine may be prepared from the local lesion, although it is to be borne in mind that this method is unsatisfactory and may lead to errors.

Burnham cautions that while both the sera and vaccines usually do little harm, neither is entirely free from danger, and that the dosage and intervals must be carefully worked out in each case.

Finally, in the management of this type of case, he emphasizes the importance of *open-air treatment* in order to increase the resisting power of the patient.

In the course of a paper on "Chronic Focal Infection as a Causative Factor in Chronic Arthritis," Billings¹ alludes to the use of antistreptococccic serum in the management of chronic arthritis. A polyvalent serum was obtained by immunizing two horses with approximately thirty strains of streptococci obtained from the foci of infection of patients suffering from *arthritis deformans*. While the serum seemed to intensify the immunizing effects of the autogenous vaccines, unfortunately, in spite of all known precautions, every patient suffered, after the second or third treatment, with anaphylaxis. Usually this was manifested as an erythema and urticaria, with intense itching of the skin. Three of the patients, however, suffered from anaphylactic shock of such severity that they nearly died. As there seemed to be no way in which these accidents could be avoided, Billings was forced to abandon the use of the serum.

In regard to the use of *vaccines*, Billings makes the following observation:

"There is a value in vaccine therapy, but to obtain benefit from vaccines they should be rationally used. To use vaccines, simple or mixed, in the treatment of a patient, without first ascertaining the nature of the disease, and, if infectious, the kind of invading organism, is unscientific, reprehensible, and wrong. When the mixed vaccines or the filtrate of culture broth of countless organisms are used, it is like the shotgun prescription of our ancestors of the profession. They were and are intended to hit something. There is this difference between the old and the new shotgun: The abused stomach could reject the old shotgun mixture; the new shotgun mixture is injected subcutaneously or intravenously, and the patient cannot escape it. It is my opinion that vaccine therapy irrationally used and the injection of so-called serums made from culture broths are usually without benefit to the patient with *arthritis deformans* and often result harmfully to the health or life of the invalid."

The treatment of *arthritis deformans* is summarized by Billings as follows: (1) The removal of the infecting focus. (2) Improvement of the immunity by rest, personal hygiene, including good food, pure air and sunshine, rational calisthenics and physical culture, moral support, and a cheerful environment. Autogenous vaccines may be used to still further improve the immunity.

Antitetanic Serum. After years of trial, the limitations of antitetanic serum are becoming better and better known. Introduced after anti-diphtheritic serum had shown its wonderful curative effects, much disappointment was felt when it was found that, as a curative agent,

¹ Journal American Medical Association, September 13, 1913.

antitetanic serum was far less successful. After being branded as a failure, in the curative sense, it gradually became apparent that the serum was very effective as a prophylactic in those instances in which there was reason to believe that tetanus might develop. Furthermore, as time has gone on and comparative figures have become available, it is recognized that, in those instances in which the serum has been employed for curative purposes, the mortality from tetanus seems to have been reduced about 20 per cent.

Permin,¹ in a survey of the results of treatment of *tetanus*, before and after the use of antitetanic serum, reports on 388 cases in Denmark. Of the 388 cases, 72.8 per cent. of the antitoxin-treated patients died when the incubation period had been less than ten days, and 94.7 per cent. of the 94 patients to whom serotherapy had not been applied. The proportion of total recoveries has risen since serotherapy came in from 21.1 to 42.3 per cent. of 199 and 189 cases respectively. A reduction of about 20 per cent. has occurred also in this country.

A similar analytical study has been made by Irons,² who has collected 225 cases not previously reported. The details of these cases were obtained by personal correspondence from hospital or private records, for the years 1907 to 1913. Irons shows, in the following table, the results obtained with and without antitetanic serum:

TABLE I.—MORTALITY OF THE SEVERAL CLASSES OF CASES.
CASES TREATED WITH ANTITETANIC SERUM.

Incubation, days.	Total cases.	Died.	Recovered.	Mortality, per cent.
5 and less	38	27	11	....
6	18	15	3	....
7	21	16	5	....
8	17	14	3	....
9	24	17	7	....
10	13	7	6	....
	—	—	—	—
	131	96	35	73.28
From 11 to 15 . . .	47	22	25	....
16 and over	22	6	16	....
	—	—	—	—
	69	28	41	40.57
Incubation known . .	200	124	76	62.00
Incubation unknown .	25	15	10	60.00
	—	—	—	—
Total cases	225	139	86	61.77

CASES TREATED WITHOUT SERUM.

10 and less	12	11	1	....
Over 10	4	2	2	....
Unknown	5	5	0	....
	—	—	—	—
Total cases	21	18	3	85.7

¹ Mitteilungen a. d. Grenzgebieten d. Med. und Chir., 1913, vol. xxvii, No. 1.

² Journal American Medical Association, June 27, 1914.

From this it is seen that the mortality in all cases receiving serum is 61.77 per cent.; in 21 cases without serum the mortality is 85.7 per cent. While the latter group is too small to draw conclusions from, the result agrees closely with the results of other observers, namely, from 78 to 89 per cent. Permin's results, quoted above, were 78.9 per cent. in 199 cases without serum, and 57.7 per cent. in 189 cases receiving the serum.

In Table II Irons shows how important are the element of time and the size of the dose:

TABLE II.—RESULTS WITH RESPECT TO TIME WHEN SERUM WAS GIVEN AND SIZE OF DOSE IN FIRST TWENTY-FOUR HOURS OF TREATMENT.¹

A. Cases receiving first serum within twenty-four hours of first symptoms:

Incubation, days.	Large doses		Small doses		Mortality	
	Died.	Recovered.	Died.	Recovered.	Large D.	Small D.
10 and less	41	13	21	3	75.9	87.5
Over 10	11	15	6	3	42.3	66.6
Totals	52	28	27	6	65.0	81.8

B. Cases receiving first serum in second twenty-four hours after first symptoms:

10 and less	11	9	6	0	55.0	100.0
Over 10	2	8	1	0	20.0	....
Totals	13	17	7	0	43.3	100.0

C. Cases receiving first serum over forty-eight hours after first symptoms:

10 and less	10	6	7	4	62.5	63.6
Over 10	7	10	1	5	41.1	16.6
Totals	17	16	8	9	51.5	47.0

Grand totals:

10 and less	62	28	34	7	68.8	82.9
Over 10	20	33	8	8	37.7	50.0
Totals	82	61	42	15	57.3	73.7

A glance at the "mortality" column shows that in every instance the death rate is higher when a small dose is employed; with one exception the margin of difference is very marked.

The question of dosage and method of administering the serum will be considered later in commenting on the paper by Park and Nicoll.

In order to understand why antitetanic serum has been so successful as a prophylactic, and only partially successful as a curative agent, it is necessary to recall briefly the evolution of the disease from the onset of the initial infection.

The type of wound is of some importance. Punctured wounds, notably those from rusty nails, were recognized as forerunners of lock-jaw long before the real nature of the disease was known. Wounds acquired about stables, or which become contaminated with street

¹ In this table a small dose = 3000 units or less subcutaneously; a large dose = over 3000 subcutaneously or 3000 or less intraspinally or intravenously.

dust, are most apt to be followed by tetanus. The knowledge of this fact has lead to the routine procedure, in some hospitals, of treating wounds of this character with prophylactic injections of serum. While any wound may become infected with tetanus bacilli, the wound which is most dangerous is that in which the infected material is either carried deep into the tissues, as in the case of the blank cartridge, or that in which the external opening is small and quickly becomes sealed. The tetanus bacillus, being anaerobic, has an ideal place for development in a wound from which the air is excluded when, in addition, the wound contains serum and blood-clot, both of which furnish an excellent culture medium. There is no definite incubation period. In those instances in which the history of injury is clear, it is known that the disease may develop within two or three days, or that it may be delayed for as long as three weeks. A knowledge of the length of time which elapses between the time of the injury and the onset of the tetanus is important from the stand-point of prognosis. Experience has shown that when the disease develops within eight days, the infection is severe, and that the outcome will quite likely prove fatal. Cases with a short incubation period are called acute. When the period between the time of infection and the onset of the disease is later than eight days, the disease is, as a rule, not so severe. The majority of the reported cases of recovery from well-developed tetanus are of this so-called chronic type.

The symptoms of tetanus are caused by a toxin which has a special predilection for nervous tissue, particularly for the ganglion cells of the brain and cord. Its union with these cells causes the stiffness and spasms which characterize the disease. The toxin reaches these nerve cells in two ways: (1) by direct extension along the nerves, and (2) by way of the blood. The former is by far the most important. Once the union between the toxin and the ganglion cells occurs, the anti-toxin is unable to neutralize the former. For this reason some patients have received already a fatal dose of toxin in the peripheral and central nervous system when they are first seen, and will die no matter what is done. It is only when the toxin is free in the blood and lymph that the serum is efficient, when introduced intravenously or intramuscularly. McClintock and Hutchings,¹ from experimental studies, state that the toxin appearing in the blood-stream is self-limited, even in the fatal cases. The presence of a large amount of toxin in the blood several days before the onset of clinical symptoms makes it imperative that a method be devised for easily determining this. They believe that when such a method is available, a large proportion of tetanus cases could be saved.

Permin² has shown experimentally that antitoxin introduced intra-

¹ Journal of Infectious Diseases, September, 1913.

² Mitteilungen a. d. Grenzgebieten d. Med. und Chir., vol. xxvii, No. 1.

venously or intramuscularly does not neutralize toxin in the nerves. He was able to produce tetanus experimentally in animals by injecting toxin directly into muscular nerves, even when the animal had been thoroughly immunized beforehand by the injection of antitoxic serum.

These observations have a very important practical application, as they show that the antitoxin is of value only when the serum is free in the blood and lymph; and that, in order to reach the toxin travelling along the nerve paths the serum must be injected intraspinally.

In order, therefore, that better results may be obtained with the antitetanic serum, treatment must be instituted earlier than is at present practised; the dose must be larger, and the introduction of the serum must be by the intraspinal route if at all possible. The necessity for haste is also emphasized by Irons.¹ He points out that the toxin free in the blood must be neutralized as quickly as possible, and recommends, as the quickest method of accomplishing this, the intravenous administration of the serum.

In order to test the efficiency of the intraspinal method, Park and Nicoll² undertook some experiments, using guinea-pigs in their work. As a result of their experimental studies, and the records of six consecutive clinical cases of tetanus in which recovery followed the intraspinal injection of antitetanic serum, Park and Nicoll feel that the following recommendation is justified.

"In every case strongly suspected of being tetanus, from three to five thousand units of tetanus antitoxin should be given at the first possible moment intraspinally, slowly by gravity, and always, if possible, under an anesthetic. In order to insure its thorough dissemination throughout the spinal meninges, the antitoxin should be diluted, if necessary, to a volume of from 3 to 10 c.c. or more, according to the patient's age. When fluid is drawn off previously to the giving of the antitoxin, an amount of the latter somewhat less than that of fluid withdrawn should be given. A number of cases of 'dry tap' have been observed in the disease by those so expert in spinal puncture as to leave no room for doubt that the canal was properly entered. In such cases, only a small amount of tetanus antitoxin should be injected (from 3 to 5 c.c.). In brief, tetanus antitoxin should be used in precisely the same way as anti-meningitis serum.

"Unlike experimental tetanus, it must be remembered that in the human type of the disease there is frequently a focus constantly pouring out more and more toxin, for which reason it is probably advisable to repeat the intraspinal injection in twenty-four hours. While unquestionably the blood will soon become antitoxic through this intraspinal use of antitoxin alone, yet, in order to insure the quickest possible neutralization of all toxins in the tissue fluids, it would seem advisable to give, at the same time, a dose of 10,000 or 15,000 units of antitoxin in

¹ Loc. cit.

² Journal American Medical Association, July 18, 1914.

the vein. A similar dose given subcutaneously three or four days later will insure a continuance of the highly antitoxic condition during the next five days. We do not believe there is any advantage in giving larger amounts of antitoxin than those indicated."

Irons¹ states that while it is true that in some cases the formation of the toxin may proceed slowly, and that the subcutaneous injection of antitoxin may prove life-saving, in the ordinary acute case a dose of from 1500 to 3000 units given subcutaneously can be of little immediate value in neutralizing toxin in the blood and staying the cause of the disease. It is important that the full effect of the antitoxin be obtained immediately, and this may be accomplished by giving, as outlined by Park, 3000 units intraspinally, and from 10,000 to 20,000 units intravenously at the earliest possible moment after symptoms of tetanus appear. On the following day, the intraspinal injection of 3000 units may be repeated. The blood remains strongly antitoxic for several days. On the fourth or fifth day 10,000 units should be given subcutaneously to maintain the antitoxin content of the blood.

Brem² quotes Ashhurst and John, who believe that the rational use of tetanus antitoxin consists in the intraneurial injection of antitoxin; the intraspinal injection; the intravenous injection, and the infiltration of the tissues about the site of injury. The quantity used should be very much larger than has usually been given heretofore by the subcutaneous route. Ashhurst and John have administered as much as 224,000 units during a period of three days. Brem reports a case treated along the lines suggested by Ashhurst and John. This patient received a total of 98,000 units of antitoxin.

It must, of course, be recognized that the use of serum alone is not all that is demanded in the handling of either the suspected case or the one in which tetanus actually occurs. In the case of a suspected wound, it should be incised freely in order to provide an ample external opening. If foreign material has been carried into the depth of the wound, it should be removed. The wound should then be treated with iodine or cauterized with a 75 per cent. of phenol solution, and then dressed with a wet gauze pad saturated with boric acid solution or alcohol. In no case is the wound to be closed. It should be allowed to heal from the bottom by means of granulation. It is to be understood that, whenever possible, serum is to be given as directed above. Given³ emphasizes the fact that a dirty wound implies a tetanus-bacillus infection, and that the only safe course is to act accordingly.

If tetanus actually develops, Permin⁴ recommends, in addition to the intraspinal injection of serum, that the patient be kept in a quiet, dark room, and that the spasms be controlled by the use of chloral and

¹ Loc. cit.

² Journal American Medical Association, 1914, lxii, 191.

³ American Journal of Surgery, June, 1913.

⁴ Loc. cit.

morphine together, rather than maximum doses of the former alone. If spasmotic contraction of the muscles of swallowing is a hindrance to feeding, this may be overcome by a dose of chloral half an hour before. If the paroxysms are unusually severe, they may be controlled by the additional use of a few whiffs of chloroform or ether.

Next to the serum, Permin considers the administration of a sufficient quantity of nourishing food as the most important adjunct to the treatment. Fluid foods are the best, and, in cases of extreme lockjaw, it may be necessary to pull a couple of teeth to permit the introduction of a feeding tube.

McClintock and Hutchings,¹ from observations of a large number of animals and a number of human beings dying of tetanus, believe that the exhaustion due to muscular contractions is a large factor in producing fatal results. At present the best that can be done is to neutralize the toxin with repeated doses of serum and control the muscular spasm with some sedative drug.

In this connection, it is interesting to note that Ruffer and Crendropoulo² as the result of experimental observations, conclude that different substances develop in the muscles of tetanized animals, some of which favor the effects of tetanus toxin while others check the toxic action. In their opinion, antitetanic serum is at present incomplete. This lacking substance, they assert, can be obtained from the muscles of tetanized animals. Guinea-pigs treated on this principle recovered from the experimental tetanus. Wolff³ has reported a child, aged nine days, which recovered from tetanus neonatorum as the result of serotherapy and large doses of chloral. The chloral was given by rectum, the daily dose being $7\frac{1}{2}$ grains. The chloral was gradually reduced and by the twenty-seventh day was stopped altogether. The first dose of the antitetanic serum was injected in the vicinity of the umbilicus; two subsequent doses were given intramuscularly and subcutaneously. The total dosage of antitoxin was 300 units.

The efficacy of antitetanic serum as a prophylactic is attested to by Tizzoni,⁴ from observations made in the recent Italian campaigns in Northern Africa. The only difficulty he experienced was in the matter of dosage due, to some extent, to the wide variation in the number of antitoxin units in the different specimens. He urges that manufacturers specify on each vial the exact unit content.

In regard to the various substitutes for the serum treatment of tetanus, McClintock and Hutchings⁵ assert that little, if any, value is to be expected from them.

¹ Loc. cit.

² Presse médicale, November 8, 1913.

³ Deutsche med. Wochenschrift, September 11, 1913.

⁴ Gazzetta degli Ospedali a delle Cliniche; Abstract Journal American Medical Association, July 4, 1914.

⁵ Loc. cit.

For the past twelve years the *Journal of the American Medical Association*¹ has published the results of our Annual Fourth of July Celebration. The following tables relate to the occurrence of tetanus:

TABLE I.—RATIO OF TETANUS CASES TO BLANK CARTRIDGE INJURIES.

Year.	Tetanus cases.	Blank cartridge injuries.	Ratio.
1903	417	1672	1. 4.27
1904	105	905	1. 8.62
1905	104	809	1. 7.78
1906	89	979	1. 11.00
1907	73	606	1. 8.16
1908	76	942	1. 12.39
1909	150	1225	1. 8.17
1910	72	450	1. 6.25
1911	18	185	1. 10.28
1912	7	75	1. 10.71
1913	4	97	1. 24.25
1914	3	122	1. 40.67
Totals	1118	8067	1. 7.22

• TABLE II.—CAUSES OF TETANUS CASES.

Year.	Blank cartridge.	Giant cracker.	Cannon.	Fire-arms.	Powder, etc.	Total.
1903	363	17	5	3	29	417
1904	74	18	5	1	7	105
1905	65	17	4	5	13	104
1906	54	17	1	7	10	89
1907	52	8	6	4	3	73
1908	58	5	4	3	6	76
1909	130	9	1	4	6	150
1910	64	2	..	5	1	72
1911	15	1	1	..	1	18
1912	7	..	..	..	..	7
1913	4	..	..	..	..	4
1914	2	..	..	1	..	3

As may be noted, on comparison of the statistics of this year with those of previous years (Table I) there is a significant ratio each year between the number of tetanus cases and the number of blank-cartridge wounds. The large increase of injuries from this cause in 1909 resulted in a corresponding increase in the number of cases of tetanus. A reduced number of blank-cartridge wounds almost invariably brings also a smaller number of lockjaw cases. The smaller number of tetanus cases in recent years in proportion to the blank-cartridge injuries is doubtless due to the greater care in treating wounds from this cause, and the more common and prompt use of tetanus antitoxin.

Besides the cases of lockjaw due directly to the use of fireworks, it is interesting to note those occurring during the Fourth of July season

¹ Special article, August 29, 1914.

which were due to penetrating wounds from other causes, such as nails, splinters, crushing injuries, etc. There was a continued reduction in these cases this year, only 16 cases being reported as compared with 32 cases last year. Tetanus germs were perhaps as prevalent as in previous years, the reduced number of cases from these causes being likewise due doubtless to the more common use of tetanus antitoxin.

Arsenic. In a clinical study on the comparison of the action of arsenic and iron in the treatment of *anemia* of various types, Aubertin¹ gives curves from a number of cases showing that arsenic induces the production of new red blood corpuscles, while iron induces the production of hemoglobin and favors its being taken up by the corpuscles. In some cases, arsenic alone or iron alone may restore the blood to normal, but, as a rule, both are needed. Aubertin advises not to give them together, but successively, beginning with the one which seems to be most needed at the moment.

Bramwell² states that, in the treatment of *pernicious anemia*, none of the remedies which have been used, with the exception of arsenic, has stood the test of a prolonged trial. In giving arsenic by mouth, Bramwell begins with 2 minims of Fowler's solution, three times a day after food, and increases the dose by one drop every fourth or fifth day until the maximum which the patient can take is reached. This dose varies greatly in different cases. In the majority of instances, it is from 10 to 12 drops three times a day; in some cases, 16 to 20 drops three times a day, may be tolerated. After the maximum dose, which the patient can take, is reached, it is continued for several weeks. In some cases, intestinal disturbances, particularly diarrhea, are produced, even by small doses. Bramwell has found that by combining a small dose of morphine, an eighth of a grain or less, with each dose of arsenic, the latter is usually quite well borne. He warns that the prolonged use of arsenic may lead to the production of an arsenical neuritis, but that some risks must be run, as pernicious anemia, if allowed to go on, will most certainly kill the patient.

After seeing the remarkable results obtained with *salvarsan* in the treatment of syphilis, Bramwell thought that possibly it might give as good, or even better results in *pernicious anemia* than the ordinary arsenical treatment. In the two and a half years that he has employed *salvarsan* in pernicious anemia, he has treated eleven cases with, on the whole, most remarkably beneficial effects.

It will be recalled that when *atoxyl* was first introduced in the treatment of the sleeping sickness a number of cases of blindness were reported following its use. Steinebach³ has recently reported an instance in which blindness occurred in an alcoholic woman who was given *atoxyl* because of a moderate secondary anemia.

¹ Presse médicale, May 20, 1914.

² British Medical Journal, May 24, 1913.

³ Berliner klin. Wochenschrift, January 15, 1914.

The smallest total dosage of atoxyl previously reported as having produced blindness was 3.4 gm. The case reported by Steinebach is of interest because she received a total of but 1.2 gm. He points out that a predisposition seems to have been present in all the cases so far reported: cachexia from cancer or old age, autointoxication, chronic infections or intoxications, and especially chronic alcoholism. Any of these conditions, in Steinebach's opinion, should contra-indicate the use of atoxyl.

Atophan. This new synthetic drug, the official name of which is 2-phenylquinolin 4-carboxylic acid, was introduced a few years ago. It was claimed that it was of service in *increasing the elimination of uric acid* in man. Since its introduction it has been extensively employed, not only in the treatment of gouty and rheumatic affections, but also in other conditions, some of which are supposed to have a close relationship with an excess of uric acid, as, for instance, migraine, sciatica, lumbago, iritis, eczema, and urticaria.

It is, therefore, of interest to note the results of studies made by Folin and Lyman,¹ Haskins² and McLester.³ Folin and Lyman studied the case of a man of fifty-five years, who suffered from gouty attacks in the ankles, knees, toes and right hand, and who had large tophi in several places, and who had, in addition, a large abscess in the forearm which showed an abundance of uric acid crystals. They found that the administration of atophan brought him no relief, and that the drug did not increase the uric acid output, nor did it bring about an appreciable diminution of the uric acid in the blood. In five other cases in which there were distinct gouty symptoms, however, the administration of atophan in every instance led to an increase in the uric acid elimination and a marked reduction of the uric acid in the blood.

Haskins, as a result of his studies, draws the conclusion that the main effect of atophan is to drain uric acid out of the blood, leaving the uric acid content of the latter subnormal.

McLester found that while the amount of uric acid in the blood of different individuals varies widely, the amount for a single individual is constant. He concludes that atophan increases general renal activity and exerts a selective stimulating influence on uric acid elimination which simultaneously reduces the uric acid in the blood. Its influence over uric acid metabolism would, therefore, seem to be limited to its power of transferring, by means of the kidney, uric acid from the blood to the urine. This summarization is in harmony with the results obtained by Folin and Lyman, and by Haskins.

Phillips⁴ has reported 5 cases in which the use of atophan, in

¹ Journal of Pharmacology and Experimental Therapeutics, July, 1913.

² Ibid., September, 1913.

³ Archives of Internal Medicine, December, 1913.

⁴ Journal American Medical Association, September 27, 1913.

therapeutic doses (5 to 15 grains three times a day), was followed by skin eruptions. In 3, it took the form of an urticaria; in 1, a purpura; and, in the fifth, a scarlatiniform eruption. He quotes instances from the literature in which similar results occurred. Phillips believes that these cases show that skin rashes, resembling those following the administration of antipyrin, are not uncommon after atophan has been taken, and that this drug should not be given in the treatment of urticaria, as has been advised.

Herrick¹ also records an instance in which a scarlatiniform rash followed the use of atophan.

One of the most perplexing situations which confronts the physician is the interpretation of skin rashes. We are all familiar with the unfortunate results which have followed the failure to do so. Only recently I was forced to isolate a patient for some days, because of an eruption which had all the characteristics of scarlet fever, although it fortunately proved in the end to be a drug eruption. It is always well to be familiar with the drugs which are apt to produce these conditions, and also the character of the eruption produced.

Weiss,² in reporting an unusual case of bromoderma, takes up the question of *drug eruptions* in general. He brings out the salient features of these eruptions in the following conclusions:

"1. Drug eruptions may simulate almost any known skin affection.
"2. A skin eruption starting suddenly without any prodromal symptoms is almost sure to be a medicinal eruption.

"3. The violence of development, the preponderance of the local over the systemic disturbances, is characteristic of drug eruptions.

"4. The brevity of the acute stage and the quickness of defervescence constitute a notable asset in diagnosis.

"5. The usual four stages of the acute contagious exanthems, namely, the prodromal stage, the eruptive, the fully developed and retrogressive and the desquamative stage, are wanting.

"6. The temperature never rises to the point shown by the acute exanthems, and the affection of the mucous membrane is never so severe."

Atropine. Pletnew³ for some years has made a study of the effect of *atropine in stomach affections*. In view of his results, he expresses surprise that so little use of the drug has been made, as it can be relied on when secretion or motor functioning, or both, are deranged, or there are anatomic lesions in the stomach wall.

According to Pletnew, atropine checks secretion, reduces acidity, combats pylorospasm and hour-glass spasms, and relieves pain as the spastic conditions are due to the excessive secretion of hydrochloric acid. The more acid the stomach contains, the longer the pylorus

¹ Journal American Medical Association, October 11, 1913.

² Ibid., August 22, 1914.

³ Therapeutische Monatshefte, January, 1914.

waits before opening. While the atropine is only a symptomatic remedy in these conditions, it is nevertheless a very valuable one and is capable of rendering valuable service.

Another condition in which pain is the result of spasm is *dysmenorrhea*. Novak¹ states that he has found a history of painful menstruation in nearly every one of his cases of *puerperal bradycardia* and *arhythmia*. Believing that there might be a common factor in the production of these two disorders, he was led to try the influence of atropine, which has such a prompt action on bradycardia due to abnormal irritability of the sympathetic nervous system.

In small doses atropine has a stimulating and, in large doses, a paralyzing action on the sympathetic nervous system. Novak believes that, in the few instances in which the atropine failed to relieve the dysmenorrhea, the dosage was incorrect. He applied this treatment in a large number of cases, but only 38 were followed for any length of time, and of this number 30 were materially benefited by the atropine. Novak states that the predisposition to dysmenorrhea is either congenital or acquired, and that the pains usually can be classed as menstrual colic, possibly a kind of vascular crisis; pains suggesting labor, due to clots of blood or other abnormal contents in the uterus, or accumulation of blood with obstruction to evacuation, and, lastly, pain from hyperemia—local congestion. The favorable results are due to the paralyzing of the nerve terminals by the atropine.

Novak thinks there is a very promising field in gynecological practice for atropine, and that it may be profitably employed to ward off impending abortion, to relax painful stricture of the sphincters of the bladder or anus, and to keep the genital organs still, and prevent ascending infection in cases of local inflammatory processes. Atropine is contraindicated when there is atony of the uterus, because of the danger of hemorrhage, and also when abortion or labor is once under way, and there is considerable uterine hemorrhage.

Benzine. It will be recalled that benzine is a product of crude petroleum, and is not to be confused with benzol, which is obtained in the fractional distillation of coal-tar. Benzine has no medicinal use. Its ingestion, whether by mistake or otherwise, is apt to be followed by death. Jaffe² has encountered two fatal cases of benzine poisoning, and was able to find reports of 9 additional cases in the literature. Experimental studies on guinea-pigs and rats confirmed the findings encountered in human beings. The typical injury in benzine poisoning appears to be extensive hemorrhages in both lungs. The benzine is evidently eliminated through the lungs, and, if it is rapidly absorbed, so much is eliminated at once that extensive hemorrhages result, with a promptly fatal outcome. Absorption from the stomach proceeds very slowly,

¹ Wiener klin. Wochenschrift, December 18, 1913.

² Münchener med. Wochenschrift, January 27, 1914.

so that when benzine is exclusively in the stomach it may be possible to wash it out and thus save the victim's life.

The amounts that proved fatal varied widely, ranging from a single swallow of the substance to 50 grams and more.

Benzol. The use of benzol in the treatment of *leukemia* was reviewed *in extenso* in PROGRESSIVE MEDICINE last year. The drug has now been used sufficiently long to prove that it is probably the most efficient remedy that we have in overcoming the leucocythemia. It is also evident, however, that the favorable results, like those which follow the use of arsenic, are all too frequently only temporary. F. H. Smith¹ states that while the drug is capable of producing remarkable results, it is a two-edged sword, deserving of the utmost caution as to its administration. Smith emphasizes the fact that benzol is not benzine. The former is obtained in the fractional distillation of coal-tar, while the latter is a product of crude petroleum. It is most essential that the benzol shall be chemically pure, as much of that ordinarily obtained in the market is contaminated with various foreign substances.

Barker and Gibbs,² as a result of their observations, emphasize the following facts: (1) that benzol does possess dangerous toxic properties; (2) that its clinical effects are not yet clearly understood, and (3) that the greatest care should be exercised in its administration. In their opinion, no patient should be treated with benzol unless he can be kept under continuous close observation; for the present, therefore, it would seem advisable to restrict its use to the treatment of patients in hospitals, rather than to run the risks attendant upon its extension to domiciliary practice. This warning serves to recall the experience Billings³ had with one patient who left the hospital to continue the treatment at home. In this instance, severe toxic symptoms developed as the result of the patient's misinterpreting instructions as to dosage.

Another danger to be avoided is a too low reduction of the leukocytes. Spiegler⁴ reports a case in which the leukocytes were reduced to four hundred, and refers to two similar cases in which the leukocyte count was reduced, in one instance, from 988,000 to 1720; and, in another, from 56,000 to 5300, and later to 200. These experiences serve to emphasize the necessity of controlling the dosage by frequent blood-counts. This point is also emphasized by Meyers and Jenkins.⁵

During the past year the following cases have been reported by Sappington and Pearson⁶ (3 cases); Smith⁷ (2 cases); Liberow⁸ (1 case);

¹ Journal American Medical Association, March 21, 1914.

² Johns Hopkins Hospital Bulletin, December, 1913.

³ PROGRESSIVE MEDICINE, December, 1913.

⁴ Wiener klin. Wochenschrift, April 16, 1914.

⁵ Albany Medical Annals, July, 1913.

⁶ Journal American Medical Association, July 11, 1914.

⁷ Ibid., March 21, 1914.

⁸ Therapeutische Monatshefte, May, 1914.

Forsati¹ (1 case); Barker and Gibbs² (1 case); Meyers and Jenkins³ (1 case), and Spiegler⁴ (1 case). All of these cases showed favorable results, although in some a relapse occurred, and in two death took place. Quadrone and Buzzano⁵ report 4 cases in which little if any benefit was noted.

For the most part the benzol treatment has been employed in cases of myeloid leukemia, and it is in this type that the most favorable results have been obtained. Opinion as to its effect in cases of acute lymphatic leukemia vary. Sappington and Pearson⁶ obtained negative results in 1 case of this type, while Muhlman⁷ reports a case in which there was at first improvement, and later a relapse followed by death. Pulowski⁸ reports a case in which an excellent result was obtained with benzol in association with the Röntgen rays.

Last year attention was called to the fact that benzol should be used with caution owing to its toxic action on the liver cells, and reference was made to the experimental work of Pappenheim, who was able to produce necrosis of the liver in rabbits with benzol.

Three autopsies have been recorded in the past year in cases in which benzol had been employed. In Spiegler's⁹ case one of myeloid leukemia, the autopsy revealed signs of a severe toxic injury of the parenchyma of various organs, and especially in the liver and kidneys.

Muhlman¹⁰ reports a case of lymphatic leukemia in which extensive necrosis of the liver was found at autopsy. In the case of fatal acute leukemia reported by Sappington and Pearson¹¹ there was no liver necrosis or other damaging effects of benzol apparent.

Kiralyfi¹² reports 2 cases of inoperable recurring *mammary cancer* in a man and in a woman, in which he used benzol. In both cases, the cancer tissue was destroyed by the direct contact with the benzol, but the cancer tissue beyond continued its course unmodified. He states that benzol evidently has a remarkable influence on the cancer cells, but that it is merely a local action. In this it resembles the Röntgen rays, thorium, and any other non-surgical means of treatment.

The dose of benzol, as ordinarily employed in the treatment of leukemia, is about 7 minims three or four times a day. It is mixed with an equal quantity of oil which is placed in a capsule immediately before it is to be swallowed.

¹ Semana Medica, September 11, 1913.

² Johns Hopkins Hospital Bulletin, December, 1913.

³ Albany Medical Annals, July, 1913.

⁴ Wiener klin. Wochenschrift, April 16, 1914.

⁵ Riforma Medica, October 25, 1913.

⁶ Loc. cit.

⁷ Deutsche med. Wochenschrift, October 23, 1914.

⁸ Wiener klin. Wochenschrift, May 7, 1914.

⁹ Loc. cit.

¹⁰ Loc. cit.

¹¹ Loc. cit.

¹² Berliner klin. Wochenschrift, October 27, 1913.

Blood-serum. The use of blood-serum for the control of *hemorrhagic disease of the newborn* has won for itself a permanent place. At the present time there is no question as to the efficiency of the blood-serum in this condition, but there is some difference in opinion as to the best method of applying it. Collander¹ has reported a successful case in which he used *coagulose*, which is obtained by precipitating the blood-serum of the horse. It is a sterile, soluble, anhydrous powder containing the fibrin ferment for clotting the blood. The method of using it is very simple. To the contents of one bulb is added 6 or 8 c.c. of sterile water. This is vigorously shaken until the powder is dissolved. The injection is made subcutaneously and may be repeated until the bleeding stops.

Cooley,² in an article on hemorrhagic disorders, favors transfusion. He refers to 2 cases in which the use of serum powder failed, and success was obtained by means of direct transfusion. In the management of these cases Cooley urges the adoption of transfusion, and that it be used as a first rather than a last resort. His conclusions are as follows:

"1. Blood therapy of some kind is the best remedy we have for hemorrhagic conditions.

"2. In hemophilia, blood-serum seems to have a specific action so far as checking the hemorrhage is concerned. It may be used as a prophylactic measure, as well as to stop existing hemorrhage. Fresh human serum is probably to be preferred.

"3. In purpura, melena and other toxic conditions, in which various blood elements have been shown to be lacking, none of the serums are always effective, and there are good theoretical and clinical reasons for believing that whole blood should be preferred, not only to stop hemorrhage, but for a possible curative effect on the underlying disease condition.

"4. Transfusion is not really a difficult procedure. It is deserving of extended trial—not as a last resort, but as the first treating in any of the hemorrhagic diseases of toxic nature."

Whipple,³ in a review of the various methods of applying the blood-serum, concludes that at present direct transfusion seems to offer the greatest hope of permanent relief.

Lespinasse⁴ reports 14 successful cases, with two deaths, both of which were due to syphilis. In discussing the advantages of transfusion as set forth by Cooley,⁵ Lespinasse emphasizes the fact that it is never too late to save a baby by transfusion, so long as there is a flutter in the heart; even if the heart has stopped for a few minutes, there is a chance to save the baby by a transfusion properly done.

¹ Therapeutic Gazette, May, 1914.

² Journal American Medical Association, October 4, 1913.

³ Archives of Internal Medicine, December, 1913.

⁴ Journal American Medical Association, June 13, 1914.

⁵ Loc. cit.

He points out that in hemorrhage of the newborn the patients are not hemophiliacs, and do not bleed in after-life at all. All sorts of operations have been performed on these babies from one week to several months after the bleeding ceased, and there has been no extraordinary hemorrhage. These children grow and become normal healthy persons.

In Lespinasse's series the father was the donor in 10 cases, the mother's half-sister in 1, and a non-relative in 3.

The bloodvessels used were the radial artery in 7 cases, and a forearm vein in 7 cases on the donor; on the baby, the femoral vein was used in four instances and the jugular in ten. The duration of the transfusion varied from five to fifteen minutes. The following table shows the cases from the literature:

Reporter.	No. of cases.
Soresi, New York	9
Vincent, Boston	7
Cooley and Vaughan, Detroit	1
Bernheim, Baltimore	1
Murphy, Boston	1
Berg, New York	1 ¹
J. J. Hubbard, Boston	1
Alexis Carrel, New York	2
V. D. Lespinasse, Chicago	14 ²
Total	37

There seems to be little doubt but that transfusion is becoming more and more the method of choice. If it is impossible to apply it, human serum may be injected subcutaneously, or, in default of this, serum powder or even horse serum. The operation for transfusion is comparatively simple, the details of which can be obtained from any standard work of surgery.

Bromide of Sodium. A new method of using bromide in the treatment of *delirium tremens* has been suggested by Kraemer.³ Kraemer points out that the essential pathology of the condition is cerebral edema, and that the amount of cerebrospinal fluid is increased to such an extent that one can readily withdraw through lumbar puncture 50 to 60 c.c. He has already shown that this fluid is extremely toxic, and that its injection into dogs brings about a rapid fall in blood-pressure. In an endeavor to find a method of medication which could be directly introduced into the subarachnoid cavity after the withdrawal of the toxic fluid and which would counteract the edema and act as a sedative, Kraemer found, from experimentation on lower animals, that sodium bromide answered the purpose splendidly. He has applied the method in 20 cases with entire safety.

¹ Syphilitic and died.

² Two syphilitic patients; both patients died. Three deaths and thirty-four recoveries.

³ Boston Medical and Surgical Journal, October 30, 1913.

"The technique of the treatment consists in the withdrawal of cerebrospinal fluid through lumbar puncture in amounts as great as possible, namely, 50 to 60 cubic centimeters. The same amount of a sterile 1 per cent. solution of sodium bromide is injected with a syringe. There is absolutely no danger from increased subdural pressure. This amount, and even as high as 80 cubic centimeters of fluid, have been injected into the subdural cavity in an interval of one minute without the least sign of increased intraspinal pressure. This salt—that is, the sodium bromide—is not toxic to the nervous system. The potassium salt must not be used, since it is slightly irritating."

As a rule there is an immediate improvement in the delirium. This, however, disappears after a short time, to be followed in from twelve to fifteen hours by a permanent disappearance of the delirium.

Mild cases of delirium tremens are, as a rule, readily controlled by withdrawal of the alcohol, the use of stimulating broths and the production of sleep by means of chloral given per rectum. While this method is highly successful in the mild and moderately severe cases, it often fails in the desperate cases. Any one who has seen severe delirium tremens will welcome a method that offers a chance of allaying the incessant delirium which is sure to prove fatal if quiet cannot be secured. It is in this latter group that Kraemer's method would seem to offer a promising field.

Caffeine. Several years ago the United States Government instituted a suit against the proprietors of a well-known "soft" drink, on the ground that the beverage contained large amounts of caffeine, and was, therefore, injurious. Among the evidence produced by the defense were some clear-cut experimental results showing that caffeine was not a dangerous stimulant. The experimental work of Hollingworth¹ was of the greatest interest because it brought out certain facts regarding the action of caffeine which had not been known. As the result of extensive and painstaking experiments, Hollingworth showed that caffeine had the power of stimulating the psychic centres, and that it also possessed the peculiar property of stimulation without succeeding depression. Thus the individual who was given a dose of caffeine was thereby stimulated, but when the effect of the drug wore off, there was no let down below the point at which the caffeine had been administered.

Poffenberger² has contributed a paper on the "Comparison of the Effects of Caffeine and Strychnine on Mental and Motor Efficiency." He briefly summarizes the action of the two drugs as follows: It may be said that, with certain differences in the details, there is a general agreement that caffeine acts predominantly on the higher centres of the nervous system, while strychnine acts predominantly on the lower centres. These conclusions have been reached in part as a result of experimental

¹ Archives of Psychology, 1912.

² Therapeutic Gazette, April, 1914.

work in physiology, but for the greater part as a result of clinical observation.

Poffenberger states, however, that the real question of importance, both to psychology and to medicine, is whether strychnine, which is often used interchangeably with caffeine as a nervous stimulant, makes the wheels run easier as does caffeine, or simply acts as a whip whereby the patient expends some energy and becomes thereby rapidly exhausted.

Poffenberger's present report is an attempt to answer this question. The experiments on which his conclusions are based consisted of a series of tests covering about forty days. The first part included a period of about four weeks, in which tests were given five times daily, and the second included several days, in which tests were given continuously for a period of about twelve hours.

The tests used were those standardized by long service in the Psychological Laboratory of Columbia University, and may be roughly divided into two groups, motor tests and mental tests. The motor tests measured the rapidity of movement of the arm, by what is known as the tapping test; the accuracy and speed of the arm movements by what is called the coördination or three-hole test; and the muscular control of the arm when voluntarily held in a given position, called the steadiness test.

Two types of mental tests were employed, those measuring, first, perception and association, and, secondly, attention, discrimination and judgment.

In the tapping test, Hollingworth found a clear stimulation about equal in degree for every size of dose, and with each of five subjects. Moreover, he found no after-effect of any kind following the stimulation. In the steadiness test there is a suggestion of unsteadiness with the smallest doses which becomes pronounced with the larger doses. Also the larger the doses the more quickly does the unsteadiness develop. In the case of the coördination test there is an improvement with small doses and a disturbance with the larger doses for each of the five subjects.

In regard to the mental tests, it was found that, in general, the smaller doses produced the greatest stimulation. In the calculation test, four of the five subjects showed stimulation, its amount increasing with the size of the dose. The stimulation comes rather late, and is still present at the close of the day. There is no evidence of secondary depression.

In the cancellation test, involving discrimination and attention, the smaller doses show a slight retardation, while the larger doses yield a pronounced stimulation. While individuals differ, the general tendency may be said to be stimulation. There is no positive evidence concerning the persistence—time or after-effects—in the case of this test.

Concerning the general effects of caffeine, Hollingworth says that small doses do not affect the quality of sleep, but larger doses produce a marked impairment with most subjects. In doses of about 4 grains the

men experience dizziness and headache, while in the women these effects were more pronounced, probably on account of the difference in body weight of the two sexes.

The part of the experiment in which the effect of the caffeine was intensively studied served to confirm the results of the first part, and to give farther evidence of the absence of any depressing after-effect.

The results from the strychnine research are in striking contrast to those obtained with caffeine. It may be stated that, in general, the results with strychnine were negative—that is, there was neither a stimulation nor a retardation in any of the tests employed, except in the case of the steadiness test, when there was a tendency toward poorer records in all cases, following strychnine administration.

Poffenberger reaches the conclusion that the results of the study on strychnine are not such as to modify the two principal uses of the drug in therapeutics, namely, as a general tonic acting upon the digestive processes, and for increasing the reflex irritability of the lower centres, those of the medulla and cord. It should not be considered equally efficient with caffeine in its influence on such voluntarily controlled processes, as were studied in these experiments. Furthermore, the rather prevalent use of strychnine among brain-workers as a mental stimulant finds no support in the conclusion from these researches.

Cushing¹ has made an experimental study on two respiratory stimulants, namely, caffeine and strychnine.

Caffeine acts in the opposite way to morphine, and the same is true of strychnine. They act upon the rate, but not directly upon the depth.

The changes in the depth are due almost entirely to change in the carbonic acid tension, which, of course, is largely indirect, from the acceleration of the respiration reducing it, or from slight spasm increasing it. The action of caffeine is very much more marked under morphine, and its action persists for a much longer time. In normal animals there is an acceleration under caffeine which, as a general rule, passes off in ten minutes at the most. Under morphine, it may last half an hour or so after the injection.

As to whether caffeine or strychnine could replace carbonic acid in the acceleration of the respiratory centre, Cushing found no evidence that this was the case. On the contrary, caffeine and strychnine accelerate respiration after cutting the vagi, which shows the different method of action.

Camphor. The use of camphor as a rapidly acting stimulant in cases of profound weakness or collapse is another example of the disagreement which sometimes arises between well-established clinical evidence and experimental studies. For years camphor has been used when a rapidly

¹ Proceedings of the Royal Society of Medicine, April, 1913.

acting stimulant was indicated. In commenting on its value, Hare¹ points out that while it may be true that ordinary instruments of precision fail to show any effect on the body, it is entirely possible that by stimulating phagocytosis, or producing other changes in the organism, it may materially aid the patient in his struggle with disease.

Gottlieb² cites camphor as one of the drugs in which experiments on normal animals are valueless. In health this drug, according to Gottlieb, has little or no effect upon the circulation or upon the heart. In vasomotor paralysis, on the contrary, the irritability of the vaso-motor centre is markedly augmented, and the heart which has almost ceased to beat from any cause, starts off again after a dose of camphor.

Nammack³ recommends camphor very highly in extreme cases of cardiac failure where a rapidly acting stimulant is demanded. He administers the camphor hypodermically in 10 per cent. solution in ether, or in 25 per cent. solution in sterile oil.

During the past year several articles have appeared which highly recommend camphor in the treatment of *pneumonia*. Cruickshank⁴ directs that a 30 per cent. solution of camphor in oil of sesame be employed, and that as soon as possible after the initial chill 10 c.c. of this solution, equal to about 36 grains of pure camphor, be injected to each 100 pounds of body weight, the dose being repeated every twelve hours, except in cases of bilateral pneumonia and severe toxemia, when it should be given every six to eight hours.

The site selected for the injection should be the outer side of the thigh or abdominal wall, the skin being sterilized with tincture of iodine, and the injection made deeply enough to get below the subcutaneous fat, whereby all danger of abscess is avoided. These large doses, which, if taken by mouth, would heretofore have been considered as poisonous, seem to have been proved practically harmless. Seibert (quoted by Cruickshank) has given as much as 12 c.c. of a 20 per cent. camphorated oil every twelve hours, to adults suffering with pneumonia, and 6 c.c. to children who were four years old or more. Of 36 patients so treated, all recovered except one. Seibert believes that the good results obtained were largely dependent upon the fact that the camphor aided in the destruction of the pneumococci in the blood-stream. This view is further supported by reason of the fact that very minute amounts of camphor added to culture media prevent the growth of pneumococci, and also because camphor protects animals which are inoculated with pneumococci. Thus, Leo⁵ was able to protect numbers of mice against pneumococcus infection by the subcutaneous injection of a saturated aqueous

¹ Therapeutic Gazette, May, 1914.

² Archives des Maladies du cœur, des Vaisseaux et du Sang, January, 1914.

³ Medical Record, June 13, 1914.

⁴ New York State Journal of Medicine, February, 1914.

⁵ Münchener med. Wochenschrift, October 28, 1913.

solution of camphor; in rabbits, the results were less constant. Leo believes that the camphor is able to kill the pneumococci in the blood-stream, and promote reabsorption of the pneumonic exudate. It also has a marked action in increasing the ventilation of the lungs and stimulates the action of the heart, thereby pumping more blood into the lungs.

In regard to the toxicity of the drug when given subcutaneously, Weibert states that he has given as much as 45 grains at a single dose hypodermically without any evil influence. In his opinion, the true use of the drug in pneumonia is as an aid in combating infection, and while it may not be a direct germicide, it nevertheless renders the blood unsuitable for the multiplication of the pneumococcus. In cases of pneumococcal infection which invades the meninges, endocardium or pleura, he advises the addition of 3 per cent. of pure salicylic acid to the camphorated oil.

Cheinisse¹ has reviewed a number of articles which have appeared during the past year or so on the therapeutic value of camphor in the treatment of pneumonia and tuberculosis. All the evidence points to the fact that the drug seems to exert an inhibitory action on the development of the pneumococci in the blood-stream.

For years Alexander² has advocated the use of camphor in the treatment of *pulmonary tuberculosis*. He never gives over 0.1 gm. of camphor, but repeats this injection every day for a month, dropping then to 0.03 or 0.05 gm. and keeping this dose up for months.

In the incipient stage of tuberculosis no drugs are needed, but, in Alexander's opinion, if there is persistent fever, a tendency to hemoptysis and emaciation, the camphor will benefit every case, no matter how advanced. This is rather a sweeping statement and in all probability an exaggeration. Like every other remedy that has been recommended in the treatment of tuberculosis, it may help a case here and there; but that it will help all cases is hardly credible.

Schule³ has injected camphor intravenously. For this purpose he recommends ether as a vehicle. He has never noticed any ill-effects, either locally or generally, even in cases in which repeated daily injections have been made. Lenzman⁴ also states that the camphor can be injected intravenously without disturbance.

Chemotherapy. What is the exact nature of the problem the chemotherapist sets out to solve when called in to prescribe for a man or an animal infected with some living parasite—protozoön, trypanosome, spirochete—visible or ultramicroscopic bacterium? The answer to this question has been given in an extremely interesting address by Ehrlich.⁵ He points out that to destroy bacteria in a test-tube can be done by any

¹ Semaine médicale, May 6, 1914.

² Medizinische Klinik, December 28, 1913.

³ Münchener med. Wochenschrift, January 6, 1914.

⁴ Quoted by Leo, loc. cit.

⁵ British Medical Journal, August 16, 1914.

one of many disinfectants and antiseptics now in use. Applied *in vitro*, however, these various agents show a uniform tendency to attach themselves to and destroy the tissues of the host, leaving the infecting agent comparatively unharmed. Ehrlich calls such drugs organotropic and not parasitotropic.

The first step then is to find an agent capable of destroying the invader without at the same time injuring the host. As was pointed out in PROGRESSIVE MEDICINE for last year, the present procedure has been to select some drug which has been shown clinically to have some favorable effect on the disease under investigation. Even then it is necessary to make and try a succession of synthetic compounds of such a chemical nature as experience shows are likely to be parasitotropic in a high degree, and organotropic as little as possible. In other words, as Ehrlich has previously emphasized, the procedure is largely empirical.

The four chief factors on which the chances of success depend are given by Ehrlich as follows: Patience, skill, luck, and last, but not least, money.

Among the difficulties which the chemotherapist encounters are:

1. The problem of finding a synthetic drug that will kill the parasites without harming the host.
2. The production of a compound which will kill all the parasites at a single dose, otherwise the survivors may acquire a degree of immunity to the drug that will enable them and their progeny to live through subsequent injections.
3. The possibility that the animal organism may contain areas to which injected drugs have no means of access, such as the space which is filled by the cerebrospinal fluid; parasites may be harbored safely there when they are killed throughout the rest of the body.
4. The patient unfortunately may be supersensitive to the drug and because of this idiosyncrasy suffer from toxic effects much more severely than the ordinary individual.

The result aimed for is the complete destruction of the parasites with one dose—*therapia sterilisans magna*. Should some of the parasites survive the initial dose, a second or possibly more injections are given; this is termed *therapia sterilisans fractionata*. Cure by sterilization on a large scale has been accomplished in frambesia or yaws, which is almost always cured by a single injection of salvarsan. Syphilis, on the other hand, while occasionally eradicated by a single dose, usually requires fractional doses.

Chemical compounds, as Ehrlich points out, can act only on the cells (whether the cell-bodies of parasites or the cells of the tissues that compose the human body) to which they are fixed, and the only agent that can fix them is chemical affinity. It is evident, therefore, that drugs will be fixed only by the cells that have a definite chemical relationship to them. An example of this selective action has been reported recently

by Lewis and Krauss¹ from the Laboratory of the Henry Phipps Institute of the University of Pennsylvania. Another interesting feature of their report is the fact that their discovery came by chance, which, as Ehrlich has said, is one of the factors to be considered in this line of work. Lewis and Krauss, in examining the relative distribution of iodine-yielding drugs in healthy and diseased tissues, respectively, found that tuberculous tissue derived from animals to which no iodine preparation had been knowingly administered may contain amounts of iodine very appreciably higher than the normal control of the same animal. Thus the tuberculous cornea of rabbits inoculated in one eye with tubercle bacilli was found to have as much as 2.67 mg. of iodine per grain of dry tissue, whereas the healthy cornea was iodine-free.

Lewis and Krauss state that as we know nothing of the influence of various articles of diet and conditions of the various organs, particularly of the thyroid, on the iodine content of specifically inflamed tissue, it seems impossible at this time to draw final or even valuable conclusions on the basis of any such method of experimentation. On the other hand, the presence of iodine in the untreated tuberculous tissue suggests an interesting field for further study. Furthermore, it may explain the long-standing clinical belief that iodine, in some form, appears to exert a favorable influence on tuberculous infections.

In the last year's PROGRESSIVE MEDICINE mention was made of Lewis' work on the effect of various analine dyes on the tubercle. Dewitt² has reported a similar study. She found that while neither methylene blue, nor any of the allied dyes tested, had much therapeutic influence on experimental tuberculosis of the guinea-pig, the methylene blue offers, for many reasons, a favorable starting point for *tuberculosis* chemotherapy, although many modifications of it and other substances will have to be tried.

It will be recalled that about two years ago Wassermann reported that he has succeeded in healing mice with inoculated *cancers* by means of a compound of eosine and selenium. At the time Wassermann made no claims beyond what he had observed in mice. Keysser,³ employing new methods of experimentation, has obtained results which make Wassermann's claims appear doubtful. Instead of subcutaneous inoculations Keysser inoculated the cancer material into the muscle or one of the different viscera. The importance of this lies in the fact that tumor material inoculated into the subcutaneous tissue does not tend to infiltrate and spread by metastases. On the other hand, these same tumors, when inoculated into muscles or viscera, infiltrate and are prone to produce extensive metastases. Having succeeded in producing visceral inoculations, Keysser tried the action of various drugs

¹ Journal of Biological Chemistry, xviii, 1914.

² Journal of Infectious Diseases, November, 1913.

³ Zeitschrift f. Chemotherapie, 1914, ii.

which had been effective in subcutaneous tumors. The results with all drugs tried were entirely negative, including the selenium-eosin compound. Thus, while subcutaneous tumors under treatment with the eosin compounds showed a liquefaction necrosis, followed by healing, no such result occurred in the visceral tumors, which grew and caused metastases and death, just as did the tumors in control animals that received no treatment.

The explanation of the different behavior of the two kinds of tumors, as given by Keysser, is extremely interesting, and is an excellent illustration of the care which must be exercised in doing experimental work. Keysser found that while the drugs under discussion (selenium-eosin, copper-glyecocoll salt, and various selenium-vanadium preparations) destroyed tumors that had reached some size, they do not prevent the development of tumors from a fresh inoculation made just before treatment was begun, nor do they readily kill tumor cells mixed with the drugs *in vitro*. The destructive effect of these drugs on the large tumors is ascribed by Keysser to the fact that when the effects of treatment are being studied, the tumors are subjected repeatedly to palpation, which causes hemorrhage and necrosis in the tumors. The drugs found effective in causing softening and disintegration owe this to their ability to stimulate autolysis, whereby rapid softening takes place in the necrosed tumor tissue. In addition, areas of necrosis and hemorrhagic extravasations are sites wherein many foreign chemicals tend to accumulate, and this accounts for the apparent specific affinity of eosin compounds for tumor tissue. In Keysser's opinion, the reason visceral tumors failed to respond to the treatment was because they were not subject to manipulation and trauma as are the subcutaneous growths. He proved this by inoculating mice with subcutaneous tumors and treating them with the usual doses of eosin-selinate. He avoided, however, palpation or manipulation of the tumors; as a result of this, the growths did not retrogress under the treatment, but grew like the controls.

While, therefore, immediate results in the cure of cancer have been delayed, these studies have added to our knowledge of the growth of tumors under certain conditions. Furthermore the knowledge thus gained will undoubtedly lead to improved methods in developing the proper means to overcome them.

Cocaine. For many years, Porter¹ has employed cocaine in chronic affections in which there were metabolic disturbances. During the past ten years he has used it more and more in acute diseases, especially *pneumonia*. The good results obtained in this class of cases he believes are due to the great sustaining power of the cocaine.

Porter administers the cocaine in doses of 0.5 grain three times daily

¹ New York Medical Journal, April 25, 1914.

in combination with caffeine and strychnine. Although he has prescribed the drug extensively for a period of nearly thirty years, he asserts that he has never seen a single person acquire the cocaine habit.

Coley's Fluid. The use of Coley's fluid (mixed toxins of streptococcus and *Bacillus prodigiosus*) in the treatment of *inoperable sarcoma* and as a prophylactic against recurrence after operation has now been before the profession for twenty years. While not invariably successful, it often gives astonishingly good results. Spencer¹ records a successful case which is of considerable interest. Spencer's case was that of a man who had suffered from a sarcoma for one year. The tumor was soft, rounded, and freely movable beneath the left sternomastoid muscle. The mass was removed, but promptly recurred. Histologically, it was found to be a lymphosarcoma. Treatment with Coley's fluid was at once instituted. The initial dose was 0.5 minim, and this was gradually increased until the amount given daily was 10 minims; this dose was continued for two weeks more. Except for the first few doses, the fluid was injected into the tumor itself. A well-marked reaction, with a good deal of inflammation, followed each injection.

The tumor stopped growing in a week and then began to diminish in size, though this was masked, to some extent, by the local inflammation and thickening set up by the injections. After stopping the injections, the swelling subsided, and in a few days nothing could be felt of the tumor. A second course of injections was given for a month, 10 minims being administered on alternate days. A year later there was no sign of any further recurrence, and, except for the fact that the spinal accessory nerve was injured during the operation, causing some weakness of the shoulder, the man appeared to be in perfect health.

In the entire course of the treatment the man received forty-five injections, and a total of 366 minims of the fluid.

Harmer² has reported observations made since June, 1909, on the use of Coley's fluid in 91 cases of sarcoma. Of this number, 32 were available for study. The remainder were thrown out either because of too small dosage, because they could not be traced, because there was no pathological report, or because the microscopic examination showed the tumor to be a carcinoma. Of the 32 cases in which the effects of the toxins could be judged, all were primary or recurrent, inoperable sarcomata, or cases in which the growth could not be entirely removed by operation, and all were proven by microscopic examination to be sarcomatous.

All of these cases were under treatment for at least three weeks, and the average length of the treatment for the entire group was a little over three months. The average minimum dose was 11.9 minims, the maximum dose 53 minims. No other form of treatment was employed.

¹ Journal of the Royal Army Medical Corps, June, 1913.

² Boston Medical and Surgical Journal, August 13, 1914.

Harmer divides the cases into six groups:

1. Those in which there were no apparent favorable effects—10 cases.
2. Those in which the tumor softened, but did not diminish in size—5 cases.
3. Those in which the tumor disappeared or practically disappeared, but returned—5 cases.
4. Those in which the tumor disappeared, but metastases simultaneously occurred—5 cases.
5. One case in which the tumor diminished; but the growth still persists.
6. Those in which there is an apparent cure; the growths have disappeared and no metastases have occurred—6 cases.

The length of time these cases have been without any evidence of recurrence is, respectively, one year and two months; two years; two years and seven months; two years and nine months; two years and eleven months, and two years and eleven months.

Harmer believes that the percentage of apparent cures may be regarded as varying from 9.4 to 18.8. He emphasizes the fact that the treatment must be intensive, but that the increase of the dosage and the interval between them is uncertain, even after considerable experience. In his judgment, the toxins should not be administered in any case in which operative measures of reasonable safety offer a possible hope of removing the growth; nor, in his opinion, should the treatment be instituted in any case of inoperable sarcoma. His experience leads him to believe that the toxins offer no hope of benefit in cases with multiple melanotic growths, in cases with mixed-cell growths, in cases with intraabdominal growths, and in cases arising from subcutaneous tissue or bone, with the possible exception of giant-celled growths.

On the other hand, he thinks they should be legitimately employed in sarcoma arising in the nose and accessory sinuses, whether of the spindle-cell, round-cell, or giant-cell type, and in single melanotic growths. As a rule, operative treatment alone is sufficient in the giant-cell type. If, however, complete surgical eradication is impossible (as, for example, involvement of the vertebrae), the toxins should be employed in conjunction with operative interference.

Finally, it is to be borne in mind that the toxins should never be employed until the tumor is shown by histological examination to be sarcomatous.

Extract of Corpus Luteum. The particular conditions for which this form of organotherapy may be of service are given by Dannreuther¹ as follows: (1) functional amenorrhea or scanty menstruation; (2) dysmenorrhea of ovarian origin; (3) manifestation of physiologic or

¹ Journal American Medical Association, January 31, 1914.

artificial menopause, such as nervous or congestive disturbances of reflex origin (hot flashes, psychoneuroses, etc.); (4) "neurasthenic" symptoms during menstrual life; (5) sterility, not due to pyogenic infections or mechanical obstruction; (6) where the function of one ovary is impaired, or one ovary has been removed, and the compensatory activity of the other is insufficient; (7) repeated abortions, not due to disease or mechanical factors; (8) hyperemesis in the early months of pregnancy.

Dannreuther has found corpus luteum of great service in the slightly obese, pale and anemic type of young woman, who soon after puberty suffers from headaches, malaise, nervousness, acne vulgaris, constipation and scanty menstruation.

In addition to the proper hygienic measures, arsenic and iron, he has found that the addition of extract of corpus luteum apparently promotes the menstrual flow and has a salutary effect on the general economy. In addition, there is frequently noted a loss of the excess of weight, and a marked improvement in tissue tonicity.

A condition very commonly encountered, and one that is very difficult to handle, is the variable syndrome that occurs just prior to, and during, the early *climacteric* period. Some years ago I had the opportunity of studying a number of these cases. I was surprised to find that many of them had been treated for various ailments at different dispensaries, and that in but few instances was any account taken of the fact that their symptoms might be due to climacteric changes. These women are apt to complain of hot flashes, vesical irritation, or be subject to various psychoses. The usual procedure is to prescribe some form of hydrotherapy, and, in addition, valerianates, bromides or other nervous sedatives. Any one who has had experience in this line knows that failure is more common than success.

According to Dannreuther, the efficiency of corpus luteum in these cases is most striking, and can be repeatedly demonstrated. He would urge its administration as a routine measure in all cases approaching the menopause, and after hysterectomy and oophorectomy, partial or complete. In two of his cases in which pruritus vulvæ was associated with the menopause, the itching was so quickly relieved by corpus luteum that it would almost indicate a selective action on the external genitalia.

Dysmenorrhea due to functional ovarian deficiency has been relieved almost invariably by corpus luteum. Dannreuther has also seen a number of women suffering from this condition who had previously taken an ordinary corpus-luteum extract without benefit, but who were subsequently relieved by an extract made from the ovaries of pregnant animals.

Dannreuther recommends that the corpus luteum be prescribed in 5-grain capsules, three times daily; in certain instances, it is necessary

to increase the dose to 10 grains three times daily. After a week's use, there is nearly always a reduction in the blood-pressure. If the pressure drops too rapidly, the patient is ordered to discontinue the drug temporarily. Before beginning the treatment, the blood-pressure should be noted, and weekly readings made during the time the extract is being taken. If the blood-pressure falls as much as 15 mm., the therapy should be stopped until 10 mm. of the loss have been recovered, when it may be cautiously resumed. At times even a reduction of 15 mm. would be beyond the limit of safety, as it should never be permitted to fall below 90 mm. Hg. under any circumstances. In addition to watching the blood-pressure, Dannreuther insists on the necessity of obtaining a comparatively freshly made extract. To assure its being reliable, the extract should be not more than three months old.

Crotalin. The use of this substance in the treatment of *epilepsy* was first advocated by Spangler four years ago. Since then the empiric use of crotalin has been advised in a variety of conditions, among which may be mentioned tuberculosis, bronchitis, asthma, hay fever, chorea, neuritis, sciatica, lumbago, etc. In a study of the effect of this substance on animal tissues, Anderson¹ states that it can be accepted that the dried venom always contains a greater or less number of bacteria, and that the sterility tests which have been made have neglected two factors, namely, the bacterial power of the venom and the antiseptic power of the tricresol which is used as a preservative. He points out that contamination is almost inevitable when we consider the habits of the reptile from which the venom is secured, and the methods used for obtaining it from the snake, and of drying and preserving after it is obtained. Such being the case, it is, of course, fully apparent that cultural tests, unless very carefully done, may not always reveal the presence of bacteria, which it has been shown may sometimes be harmful, when they are present. This possibility of there being present pathogenic bacteria difficult of detection, taken with the further fact that one of the effects of rattlesnake venom is to reduce or abolish the normal bactericidal power of the body fluids, emphasizes the possibility of serious harm from subcutaneous injection of solutions of rattlesnake poison.

To these dangers should be added that of the favorable conditions for the growth in the area injected of aërobic bacteria by reason of the local necrosis of tissue from the specific action of the venom thereon.

In a later communication, Anderson² states that "aside from the exploitation of the sick for selfish or financial considerations, the use of some of these reagents (it really does not seem proper to call them remedies or treatments), on account of the possibilities for harm possessed by them presents a question demanding immediate and serious consideration."

¹ Journal American Medical Association, March 21, 1914.

² Ibid., July 4, 1914.

Yawger,¹ in reporting six cases of idiopathic epilepsy that had been subject to crotalin injections, gives the following results: Two patients were uninfluenced: 2 were worse during the treatment; 1, early in the course developed severe toxic symptoms, and 1 died.

Digitalis. Prior to the introduction of modern methods of studying blood-pressure, it was almost universally taught that digitalis was contra-indicated in cases of aneurism, general arteriosclerosis and aortic insufficiency. The reason for this was the belief that one of the effects of the drug was to raise the blood-pressure, and thus increase the tendency of the aneurism to rupture and to intensify the symptoms of high pressure in the case of arteriosclerosis and aortic insufficiency.

While most of the evidence points to the fact that digitalis has no influence in raising the blood-pressure, it must not be lost sight of that its use in the case of aneurism is still open to question. As was pointed out in last year's PROGRESSIVE MEDICINE there is still the risk of producing the rupture of an aortic aneurism by reason of the increased systolic output and the increased force with which this is thrown into the aorta. Hare believes this to be a real source of danger in this type of case, and for this reason cautions against the use of digitalis in spite of the fact that blood-pressure observations seem to indicate that it does not increase the blood-pressure.

In a study of the *effect of digitalis on blood-pressure*, Lawrence² reached the following conclusions:

"1. The effects of various drugs on the blood-pressure, as determined by experiments on animals, do not furnish reliable criteria for the administration of such drugs to man, since the effect may be quite different in the latter.

"2. The pressure-raising effect of digitalis as noted in animals and in healthy individuals does not occur, as a rule, when the drug is administered to individuals suffering from cardiac decomposition.

"3. The cause of the cardiac decomposition does not appear to affect the action of the drug.

"4. Digitalis preparations may be safely administered to patients suffering from arteriosclerosis, angina pectoris, or nephritic hypertension, if cardiac decompensation is present; under such conditions it rarely causes a rise in blood-pressure."

Price³ has studied 37 cases. Of these, 26 were cases exhibiting some cardiovascular affection, such as arteriosclerosis, myocardial degeneration and valvular disease, both mitral and aortic. All the patients were first of all given a thorough rest before the drug was administered in order to prevent the drug being credited with results which might be due to adventitious circumstances. The blood-pressure in these cases

¹ Journal American Medical Association, May 16, 1914.

² Boston Medical and Surgical Journal, January 8, 1914.

³ British Medical Journal, September 13, 1913.

were in some instances normal, in others subnormal, and, in others, supernormal. In 15 cases representing valvular defects, 10 showed no change in the pressure during the administration of the digitalis. Of the other 5, there was a fall equal to about 20 mm. toward the end of the period of administration; in 1 there was probably a fall, and in 1 there was a rise equal to about 20 mm. It is interesting to note that the case in which there was a rise was one of double aortic disease and mitral insufficiency with arteriosclerosis.

In 11 cases in which nothing abnormal was found in the radial artery or heart, there was 1 case that showed a rise in pressure, in 1 there was a fall, and in the remainder no effect was noted.

In some cases the observations were taken over prolonged periods, even up to five months.

It is not generally recognized that in the management of *arterial hypertension* excellent results are often obtained from the use of digitalis. Piersol¹ quotes the observations of Cushing, who has amply demonstrated that except in conditions of low tension and circulatory failure, digitalis does not raise the blood-pressure. Digitalis may, therefore, be employed in small doses with safety in these cases. It does good chiefly in those patients in whom cardiac weakness is developing, and often is wonderfully efficient in relieving the distressing dyspnea and vertigo. Piersol mentions eight cases in which digitalis was helpful symptomatically, and one-half of these patients were showing some indication of decompensation.

Bernoulli² has studied the *effect of digitalis on the heart during exercise*, using for the purpose four healthy young men ranging in age from twenty-two to twenty-eight years. Before administering the drug, the men were given the prescribed exercise for one week, or until the pulse frequency taken each day showed that they were getting used to the work.

Bernoulli concludes that the effects of digitalis are to be seen primarily, if not exclusively, in strengthening the muscular contractility of cardiomuscular insufficiency. Normal cardiac muscles, however, are not influenced by the drug. While digitalis is a heart tonic in the ordinary sense of the term, it cannot be expected to serve the purpose of increasing the capacity of the heart for work in the healthy organ, or in well-compensated heart defects. Digitalis preparations are usually indicated in the presence of incipient cardiac insufficiency, but even here no favorable action need be looked for unless the medication is accompanied by absolute rest in bed. An insufficient heart does not become more resistant under digitalis, nor is it able to recover as long as the same amount of work is required of it as led to the decompensation.

¹ Therapeutic Gazette, September, 1913.

² Münchener med. Wochenschrift, May, 1913.

Powell¹ also emphasizes the *limitations* of *digitalis*. Its great field of usefulness is in cases of chronic valvular disease with failing power of the ventricles; in fatigue of the heart after acute disease or strain, it is also of great value. He believes that it is of little, if any, value in acute pericarditis, endocarditis and myocarditis; also in chronic disease of the myocardium due to alcohol, syphilis, or coronary disease.

Barton² states that, clinically considered, it is found that beneficial therapeutic effects from digitalis are found almost exclusively in that particular form of cardiopathy known as *auricular fibrillation*. In this condition he considers the effect of digitalis as quite marvelous.

In auricular fibrillation the bundle of His may be assumed to be in a condition of pathological excitability and irritability, since normal impulse formation is replaced by impulse formation at multiple auricular foci. The action of digitalis under these circumstances is to depress the function of the bundle of His, and thus reduce both the formation and the transmission of pathologically formed impulses.

Zundel's³ explanation of the action of digitalis in auricular fibrillation is essentially the same as that given by Barton. He states that the action of the drug may be either to control the fibrillation and restore the normal auricular rhythm, or it may be confined to a steadyng of the ventricle by interference with the passage of the irregular impulses through the bundle of His. The first result, which is, of course, the more desirable, is hardly to be expected if the fibrillation has been of long standing; it is seen typically when the abnormality is quite recent and is occurring in an earlier attack of failure in a rheumatic heart. In the old, fibrotic heart, it is practically never obtained. By interference with the conductivity, however, digitalis is able to exert a very beneficial effect on the ventricle, owing to the partial heart block produced by its action, the ventricle is spared some of the continuous succession of irregular stimuli which come through the bundle of His, as able to recuperate more satisfactorily between the beats, which are, therefore, stronger and more effective. This steadyng effect of the digitalis enables the patient to be up and about in moderate comfort, if the heart is kept under the continuous influence of the drug. For this purpose Zundel recommends 5 minimis of the tincture of digitalis twice daily; it may be necessary, however, in certain cases to increase the dosage. This can be determined readily by experimenting with the dosage. The object is to keep the ventricular rate down to 70 or 80 per minute.

In handling these cases at the onset of the attack, Zundel emphasizes the importance of absolute rest in bed and mental quiet. For the latter, it may be necessary to use morphine freely, a procedure he strongly advises unless there is a pleural effusion of considerable size, or nausea

¹ Practitioner, May, 1914.

² Maryland Medical Journal, September, 1913.

³ Clinical Journal, June 4, 1913.

and vomiting. If cyanosis and right-sided dilatation are present, blood-letting to the extent of 6 ounces is often of great service. As to the use of drugs, digitalis is undoubtedly the one of choice. Its slow action at the beginning may be offset by giving the drug hypodermically, four doses in thirty-six hours, or strophanthin, $\frac{1}{150}$ of a grain.

During the early stages of the attack, the digitalis is given in doses of 20 minimis of the tincture, three times a day. If untoward symptoms, indicating intolerance, occur, the digitalis should be discontinued for two days.

In a study of the effect of the digitalis group on the isolated coronary artery, Volgtlin and Macht¹ found that digitonin and digalen produce relaxation, while digitoxin and digitalin cause a constriction. All of the nitrites were also found to produce relaxation. As a result of this experimental work the authors believe that whenever coronary spasm is to be avoided or guarded against, it would be advisable to employ the digitonin-containing preparations, or at the same time administer the nitrites. The employment of amyl nitrite for the relief of coronary spasm is, of course, a well-recognized procedure.

Focke² has employed digitalis in 100 cases of *uterine hemorrhage* during the past fourteen years. When the uterus is diseased there is not much effect from the drug, but it proved invariably effectual in 29 cases of excessive or too frequently returning menstrual hemorrhage. In these cases, Focke begins the use of digitalis a week before the anticipated menstrual period. The drinking of coffee should be discontinued as it seems to counteract the action of the digitalis. Focke states that digitalis is serviceable in differentiating between uterine conditions and often renders a local examination unnecessary in girls. If the digitalis gives no relief to the excessive uterine bleeding, some local trouble may be surmised, and a gynecological examination made.

Sykes³ emphasizes the fact that while few tinctures of digitalis are, initially, below standard, that they all, after a variable period of constant activity, undergo deterioration. This may commence within a month of manufacture, and may amount in a year to 70 per cent. or more of their original activity. He condemns commercial "non-alcoholic" tinctures, and allied preparations as being untrustworthy.

Emetine. The literature on this drug, especially its use in *amebic dysentery* is rapidly increasing, and the reports are practically unanimous in confirming the original claims of Vedder and Rogers. As was pointed out in last year's "PROGRESSIVE MEDICINE," the use of ipecacuanha in the treatment of amebic dysentery has been known for years. It has also been common knowledge that this treatment, if persevered in, was

¹ Journal of Pharmacology and Experimental Therapeutics, September, 1913.

² Therapie der Gegenwart, February, 1914.

³ British Medical Journal, June 20, 1914.

undoubtedly efficacious, but the nausea attending its use was so severe that it was extremely difficult to persuade patients to take it. Now, however, the treatment of amebic dysentery has been revolutionized by the researches of Vedder, in 1911, and by the brilliant discovery of Rogers that the amebæ can be quickly killed by the hypodermic injection of emetine, and that, when given in this way, the patient experiences little or no nausea or discomfort of any kind.

Among the reports dealing with the use of the drug in amebic dysentery the following have been noted: Sewell,¹ Mallannah,² Lukis,³ Vedder,⁴ Dudley,⁵ Low,⁶ Verteine,⁷ McCaskey,⁸ Cloud,⁹ Lyons,¹⁰ Dopter,¹¹ Allen,¹² Nott,¹³ Thurston,¹⁴ Carter,¹⁵ Munro,¹⁶ Sandes,¹⁷ and Whitmore,¹⁸ Willets, Stanly and Gutierrez,¹⁹ Yeoman.²⁰

Vedder²¹ summarizes his conclusions as follows:

1. Emetine is a true specific in amebic dysentery and hepatitis, and the results obtained by its use compare very favorably with the results obtained with salvarsan in syphilis.

2. The hypodermic use of the hydrochloride salt is the preferred method of treatment.

3. A large percentage of cases so treated continue to harbor entameba histolytica (often in the encysted and most dangerous form) in the feces for some time.

4. While, in view of this fact, it is impossible to state at present that patients treated by emetine will remain permanently cured, yet the prospects of obtaining permanent cures by this method are encouraging.

5. The presence of a considerable number of these chronic ameba carriers constitutes a sanitary menace to the community.

6. It is possible that the amebas may be removed from these carriers by a course of irrigations of quinine or silver nitrate.

7. Experiments have failed to show that emetine possesses any marked therapeutic virtue in bacillary dysentery, syphilis, rabies or trypanosomiasis.

¹ Journal of the Royal Army Medical Corps, June, 1913.

² British Medical Journal, June 7, 1913. ³ Ibid., June 28, 1913.

⁴ Journal American Medical Association, February 14, 1914.

⁵ Therapeutic Gazette, January, 1914.

⁶ Proceedings of the Royal Society Society of Medicine, April, 1914.

⁷ Lancet, June 28, 1913.

⁸ Journal American Medical Association, February 14, 1914.

⁹ Ibid., November 22, 1913.

¹⁰ New Orleans Medical and Surgical Journal, October, 1913.

¹¹ Correspondenzblatt f. Schweizer Aerzte, 1913, xliii.

¹² American Journal of Tropical Diseases and Preventive Medicine, February 1, 1914; China Medical Journal, March and July, 1913.

¹³ Indian Medical Gazette, March, 1914.

¹⁴ Ibid. ¹⁵ Ibid. ¹⁶ Ibid. ¹⁷ Ibid.

¹⁸ Ibid. ¹⁹ Philippine Journal of Science, February, 1914.

²⁰ New York Medical Journal, 1914, xcix, 327.

¹⁴ Ibid.

¹⁸ Ibid.

²¹ Loc. cit.

Low¹ believes that while the use of emetine is the recognized method of treating amebic dysentery, it is not a specific in the sense that it completely sterilizes the body from amebæ, inasmuch as relapses after its use are by no means infrequent. This is due to the fact that the amebæ become encysted, and then apparently the emetine cannot kill them, this stage being a very resistant one.

Yeoman² considers emetine a specific for amebic dysentery in the same sense that quinine is specific for malaria or salvarsan for syphilis. Given early, it acts promptly. When the amebæ have invaded the tissues deeply and are widely disseminated, cure may be permanent or clinical only. Weeks, months or even years later the encysted amebæ may reappear in active vegetative form, accompanied by symptoms of an acute attack. Hence amebic patients should be kept under observation, and, at the first signs of recurrence, a course of emetine should be given. Destruction of the mucosa and ulcers may be materially benefited by irrigations and topical application through the proctoscope.

If one is going to restrict the term "specific" to those instances in which the use of a drug is followed by an absolute cure, there is really no such thing as a specific drug. Thus mercury and salvarsan in syphilis, and quinine in malaria are, in the vast majority of cases, truly specific, but there are instances in which, even after long periods of treatment, relapses or recrudescences are met with. In spite of these exceptions, however, the above-mentioned drugs are true specifics and the same may be said of emetine. It must be recognized that protozoal infections are always very difficult to eradicate, and when anything detrimental happens to the parasites causing them, instances occur which are specially resistant, and though remaining quiescent for long periods, often give rise to the disease again. Because of the fact that there is always a possibility that we have to deal with a case in which the amebæ may be encysted, Low believes that treatment should be conducted on lines similar to that of malaria, namely, the continuance of the emetine for some time after evidences of the infection have disappeared.

Dopter³ also calls attention to the possibility of a relapse. In an experience with 51 cases, he has confirmed the invariable destructive action of emetine on the free amebæ, but it seems powerless to affect the encysted specimens. While it does not protect against relapses, the emetine promptly cures the relapse. The necessity for intermittent treatment is emphasized by Allen. His experience, while comparatively limited, has convinced him that small doses, repeated daily or almost daily, for a few days, are not sufficient to eradicate all of the amebæ, inasmuch as half of his cases have relapsed within the first year.

Carter,⁴ from an experience with 168 cases in eighteen months states that there can be no doubt as to the amebicidal action of ipecacuanha,

¹ Loc. cit.

² Loc. cit.

³ Loc. cit.

⁴ Loc. cit.

and that emetine has far greater effects than its parent drug. The sterilizing effect of the emetine is apparent in twenty-four hours in all cases of pathogenic amebiasis. If the disease has been present for a week or more, Carter found, from an examination of the stools, that the emetine destroys the vast majority of the amebal trophoxoites in the first twenty-four hours, but the stools rarely become ameba-free under seventy-two hours.

The true emetine amebicidal effects are allayed in patients who are confirmed opium habitués, and experience in India has shown that, in spite of vigorous emetine treatment, it is in this class of patients that cases of rapidly fatal acute gangrenous dysentery are apt to occur. Carter believes that this is due, not to an antagonistic neutralization of the action of emetine by one of many opium alkaloids, but to the effect of opium on the intestinal contents whereby the ameba-laden feces stagnate in the pouches of the large intestine.

Lyons and Munro, while admitting the efficacy of emetine, feel that it has not been used sufficiently long to determine whether the ultimate results are superior to those obtained with ipecacuanha. Allan, in a review of the literature, also holds this view, because of the fact that, with few exceptions, immediate results have been reported and sufficient time has not elapsed to tell whether the cures are permanent or not.

In a report on the treatment of entamebiasis, Willets, Stanley and Gutierrez contrast the results obtained with emetine and ipecac. They found that in dysenteric cases emetine gave a larger percentage of symptomatic cures and acted quicker than ipecac. Both emetine and ipecac were found to be equally efficacious in expelling the entameba from the intestinal tract, and the time required for the expulsion of the protozoa was about the same after both drugs. As a prophylactic in non-dysenteric cases, they state that *neosalvarsan* is the most efficient drug to free the bowel from the presence of entameba.

This much, however, is certain, emetine undoubtedly produces a very immediate effect and this fact alone is of the greatest advantage as it gives immediate relief from the symptoms and also frees the patient from the danger of serious complications. In this respect it resembles the action of salvarsan, for, while the latter does not at once free the body from all the spirochetes, its immediate effect is to so diminish the number that the symptoms are almost at once relieved. In the case of both drugs it will take time to determine whether patients so treated are less liable to develop serious complications.

Yeoman¹ reports 7 cases in which the duration of the disease was from six months to fourteen years. Other forms of treatment, including ipecac in 4 cases, had been employed in all the cases, with temporary benefit only. Following the use of emetine hydrochloride, 5 patients were cured clinically, 2 were greatly improved, and none died.

¹ New York Medical Journal, 1914, xcix, 327.

Two interesting reports have been published in which emetine acted promptly in cases of long standing. Vertenil reports a case in which the disease had existed for three years, and Cloud one in which it had lasted from three and a half to four years.

McCaskey has reported a case in which the patient had suffered from the disease for thirteen years. This was the case of a woman, aged seventy years, who consulted McCaskey because of constant and intractable diarrhea, which was at times bloody in character. Examination of the feces revealed many amebæ. She was given emetine hypodermically for several doses with apparent benefit. The abdominal distress became less, there was one formed stool (the first in thirteen years) and the amebæ greatly diminished in number. Two weeks after the treatment was instituted and five days after her dismissal from the hospital, she returned in the same condition as when first seen. Examination of the stools showed the presence of actively motile amebas sufficient in number to permit of a complete recrudescence of the disease.

Not only has emetine proved its efficacy in the treatment of amebiasis, but it has also proved its value as a preventative of secondary abscess formation in the liver. The latter result is accomplished by reason of the rapidity with which the amebæ are killed in the intestinal tract. Carter believes that it will also check the development of abscess formation in its earliest stages.

The management of *amebic abscess of the liver* has been dealt with *in extenso* in a series of articles appearing in the *Indian Medical Gazette* for March, 1914. Thurston, in reporting 35 cases of abscess treated with ipecacuanha, states that 21 were aspirated; of these, 17 were cured, and 4 died. Five patients were treated by aspiration followed by drainage; of these, 3 were cured, and 2 died; 9 were treated by drainage alone; of these, 5 were cured, and 4 died. Of 32 patients treated with emetine, 27 were subjected to aspiration alone, of these, 20 recovered, and 7 died.

Thurston urges aspiration repeatedly in preference to drainage, but, if the abscess is almost pointing not to aspirate, then as leakage will probably take place through the puncture, the almost certainty of another infection is added. His present practise is to inject a grain of emetine hypodermically immediately after the aspiration. At this time there is presumably a flow of serum, etc., toward the abscess cavity owing to loss of pressure produced by the removal of pus, and, for this reason, the emetine is more likely to attack the young and active amebæ in the wall of the abscess.

Sandes recommends aspiration and the use of emetine subcutaneously.

Nott practises aspiration repeatedly, and uses emetine both subcutaneously and into the abscess cavity.

As has been noted above, Carter not only considers the emetine an excellent prophylactic agent against the formation of a liver abscess,

but also believed that the drug will check abscess formation in its earliest stages. Carter differs from the others in that he considers operative measures alone sufficient, once the abscess has formed. He has not noted any marked curative acceleration of the condition of an amebic abscess due to the amebicidal action of the alkaloid. He does occasionally administer emetine, however, in cases in which there is any difficulty in drainage of the wound, to prevent amebal invasion of the external wound.

An extremely interesting case of liver abscess has been reported by Sewell.¹ In this case, the abscess had ruptured into the right lung. The abscess was opened and drained, and the operation was followed by some improvement of the pulmonary symptoms. With the closing of the wound, however, all the symptoms returned in an aggravated form. As the patient was steadily growing worse, he was given 20 grains of ipecac three times a day, but without a favorable effect. Sewell's attention having been called in the meantime to the hypodermic use of emetine in these cases, he at once instituted this treatment. The first dose of $\frac{1}{3}$ grain was followed by an immediate improvement. A few subsequent doses of $\frac{2}{3}$ grain each resulted in an apparent cure. A very marked case of abscess associated with an enormously enlarged liver was completely cured by Mallannah² through aspiration and the subsequent use of emetine. In this case, the emetine (dose 0.25 grain) was given three times a day by mouth.

The dose of emetine hydrochloride varies from 0.5 to 1 grain a day. It is generally agreed that the larger doses are more efficient than the smaller ones.

Schmitter³ reports six cases of *sprue* in which he employed emetine hydrochloride with good results. In all of these cases, the soreness of the tongue and mouth either cleared up or was improved. The feeling of tension in the upper abdomen was relieved in all shortly after the treatment was commenced. The only objection to the treatment was the increased activity of the bowels which it causes, but this is only temporary, and is trivial in comparison with the general improvement.

Raeburn⁴ and Flandin⁵ have reported favorable results in the treatment of *hemoptysis* from the use of emetine. Raeburn thinks the drug is a very valuable agent in the treatment of tuberculosis, although he does not consider that it has any effect on the tubercle bacillus itself. He has found it of especial value in the management of congestive conditions of the lung, and particularly in cases of hemorrhage. Finding in the hemorrhage cases that the sputum also was diminished by the use of emetine, he has employed the drug with good results in cases in which the amount of sputum was excessive. Raeburn uses ampules which

¹ Loc. cit.

² Loc. cit.

³ Military Surgeon, April, 1914.

⁴ British Medical Journal, March 28, 1914.

⁵ Lyon Medical Journal, September 7, 1913.

contain 0.5 grain of emetine in 15 minims of distilled water. By diluting this four times, 1 minim equals 0.04 cg. Raeburn considers that 4 minims of this dilution is sufficient when the object is to control expectoration or loosen congestion.

Flandin employs emetine hydrochloride for the control of pulmonary hemorrhage in the same manner in which it is used in dysentery. He injects into the thigh 1 c.c. of distilled water containing 0.04 c.c. ($\frac{3}{5}$ of a grain) of emetine hydrochloride. No disagreeable effects were noted and the result surprising, the hemorrhage from the lung stopping immediately. It may be necessary to repeat the injection in twelve hours or in the following day.

Guerrero¹ also reports good results from the use of emetine in hemoptysis, but found that, as a rule, it took two or three injections, and larger doses than recommended by Flandin. His patients were all in the second and third stages of tuberculosis.

Maurel² points out that emetine acts electively on the smooth fibers, and particularly on those in the bloodvessels, causing them to contract. This contraction explains the influence of emetine on hemorrhage as it causes vasoconstriction. The contraction of the smooth fibers under the action of emetine helps to reduce congestion and inflammation in a region. In all cases of local congestion, the contraction of the vessels aids in restoring normal conditions, especially in the various states associated with pulmonary congestion.

I have had no experience with emetine in hemoptysis, but see no objection to its use. The drug certainly does no harm when injected hypodermically.

In this connection a word in regard to the control of pulmonary hemorrhage may not be amiss. For this purpose there is already a long list of drugs of which the most popular is some one of the nitrites (nitro-glycerin, by mouth or hypodermically, or amyl nitrite, by inhalation); others which have been recommended from time to time are digitalis, atropine, ergot, veratrum viride, and drugs designed to increase the coagulability of the blood, such as calcium lactate or gelatine. Not one of these drugs can be relied on, and even in those instances in which the hemorrhage stops, one is never certain whether it did so spontaneously or as the result of the administration of a given drug. In the treatment of hemoptysis which occurs but once or is repeated later once or twice, I have come to rely entirely on rest in bed and the use of morphine to quiet the patient, and check the cough. For repeatedly recurring hemorrhages or large ones which threaten the life of the patient, I have never seen any favorable results from the use of drugs. Hemorrhages of the types just mentioned can be controlled, however, by the

¹ Semana Medica, December 18, 1913.

² Bulletin de l'Academie de Médecine, March 24, 1914.

production of *artificial pneumothorax*. In the few cases in which I have collapsed the lung which had given rise to the bleeding the hemorrhage has promptly ceased. In several instances in which the hemorrhages had recurred at frequent intervals for months and had resisted every form of medication, the bleeding has immediately ceased after the production of an artificial pneumothorax. This has been the experience also of others under similar circumstances.

Epinephrin (Adrenalin). Meulengracht¹ testifies to the value of epinephrin in the symptomatic treatment of *asthma*. In his experience, it does not seem to have a cumulative action, nor does the system become tolerant to its use. It apparently is as effectual each time it is repeated as at first, although it does not seem to have any curative action whatever. The earlier in the attack the epinephrin is used, the more pronounced is the effect. The epinephrin is given preferably subcutaneously, but may be inhaled in the form of a fine spray.

Pilcher² has carried out some experiments on dogs to determine the effect of the absorption of epinephrin from the nasal submucosa. The experiment was suggested by a clinical observation of Chamberlain. The latter had noted that occasionally pronounced untoward vascular effects followed the injection of epinephrin and cocaine into the nasal submucosa in nasal operations. The untoward effects noted were cardiac irregularity with occasional decrease in the pulse rate to forty or fifty per minute. Since neither epinephrin nor cocaine produces these effects when given subcutaneously, or even intramuscularly, it was suggested that absorption from the nasal submucosa must be very marked.

As a result of his experimental work, Pilcher found that the submucosa of the nasal passages was an excellent absorbing surface, at least for epinephrin, and that the effects nearly approached and sometimes even paralleled those produced by intravenous injection. Because of the rapid effect produced, the use of the drug in this manner is contraindicated in individuals in whom a sudden rise in blood-pressure is to be feared. While the quantity employed in nasal operations is small, it may be sufficient, in susceptible persons, to cause a serious rise in blood-pressure. Pilcher suggests that this observation may prove of service in cases of circulatory collapse necessitating rapid stimulation. The injection into the nasal submucosa is easily done, and while not as satisfactory as the intravenous method, it can be done more quickly.

Epinephrin has been recommended in a variety of conditions associated with hemorrhage, among them being *hematuria*. Paoloantonio³ reports the case of a child suffering with *scarlet fever* complicated with a

¹ Ugeskrift for Laeger, November 20, 1913; Abstract Journal American Medical Association, February 7, 1914.

² Journal American Medical Association, July 18, 1914.

³ Policlinico, November 30, 1913; Abstract Journal American Medical Association, January 10, 1914.

severe nephritis. The sudden appearance of blood from the kidney led him to inject epinephrin subcutaneously. Later he gave the epinephrin by mouth. Not only was the hematuria checked, but the urine cleared up and the edema was absorbed. The epinephrin was then given to thirty other cases of scarlet fever complicated with nephritis with equally good results. Paoloantonio recommends from 10 to 20 drops of a 1 to 1000 solution by mouth daily. If the case is urgent, the epinephrin should be given subcutaneously first. For the control of *gastric hemorrhage* Grünbaum¹ has found epinephrin most efficient. It should be given under these circumstances in dram doses of the 1 to 1000 solution at intervals of an hour.

Mention has been made in previous issues of PROGRESSIVE MEDICINE of the use of epinephrin in *osteomalacia*. Additional testimony as to its value in this condition is furnished by Salis² and Cavarzani.³ In all, 46 cases have been successfully treated with epinephrin; in 26 more the treatment failed. In the latter group, the epinephrin was usually stopped at the first evidence of intolerance, so that the treatment did not have a fair trial. Cavarzani states that there is good reason to believe that deficient functioning of the adrenals interferes with the normal growth of the skeleton; hence the value of epinephrin.

Eucalyptol Oil. The use of eucalyptol oil for prophylactic purposes in *scarlet fever* and *measles* has been highly recommended by Milne. The latter has had charge of a home for boys for many years, and has never had an epidemic develop in the home although the children were not isolated, but merely smeared from head to foot with eucalyptol oil twice a day for the first four days, and then once a day for six days. The tonsils were swabbed with a 10 per cent. phenol solution in oil, at first every two hours the first day, and then several times a day.

Elgart⁴ also recommends eucalyptol oil, but applies the treatment in a different manner. He relies on eucalyptol oil amulets and instead of the phenol uses inhalations of a 30 or 50 per cent. solution of lime (aqua calcis) to sterilize the throat. He also insists on the inhalations and amulets being used by all coming in contact with the patients or exposed to infection in any way. Elgart cites an instance in which in a ward containing seven children, one developed scarlet fever and was isolated. the other children for four weeks were subjected to the above treatment, and none developed scarlet fever.

Fresh Air. During the past few years not a little attention has been paid to the question of ventilation, and a number of studies have been made showing the effect of overcrowding. In regard to the latter, practically every study that has been made has shown that the morbidity

¹ Practitioner, August, 1913.

² Münchener med. Wochenschrift, November 18, 1913.

³ Zentralblatt f. Gynäkologie, April 18, 1914.

⁴ Medizinische Klinik, August 3, 1913.

rate, particularly that respecting *tuberculosis*, has had a close relationship to the number of people per room. It is, of course, to be borne in mind that there are other factors to be taken into consideration. Thus, if a family of three or four occupy one, or even two, rooms, it is because it cannot afford anything better, and an income which restricts the living quarters is also one which is incapable of procuring sufficient and suitable food.

For many years it was assumed that the principal ill-effect of faulty *ventilation* was the breathing and rebreathing of air containing chemical impurities, to an excess of carbon dioxide or to organic poison, or else to oxygen impoverishment. On the contrary, as a recent editorial article¹ has pointed out all the ill effects observable in crowded rooms seem to depend on the stagnation, high temperature and the moisture content of the air; in other words, on those factors that produce a disturbance of the normal heat regulation of the body. It has been shown, for instance, that if the temperature and moisture are kept low, human exhalations may be allowed to accumulate without noticeable effect to a point far above that ordinarily observed in the most badly ventilated room. And, on the other hand, if an individual breaths outdoor air through a tube with the body confined in a small room with the temperature and moisture at a high point, he will develop all the symptoms attributable to the breathing of foul air.

Judging from the experiments which have been made, the apparently essential thing is to keep the air in motion. Air that is cool and in motion has a stimulating effect, producing invigoration and improvement of the general health. When the body loses heat at a suitable rate, heat production must also proceed at a certain rate in order to compensate for the loss and metabolism is increased at an equal pace. Moreover, the action of cool, moving air on the skin and cutaneous nerves is probably in itself beneficial, thus leading to a desire for exercise and this increased activity increases metabolism.

Everyone is familiar with the effect that is produced from sitting in a close, overheated room. "Exposure to the stagnant air of confined places allows the skin to become surrounded with an envelope of warm air which prevents the body from losing heat at a proper rate. The nerve endings of the skin are not stimulated. The circulation is depressed. Reluctance to exercise and to any bodily exertion becomes marked. Expansion of the lungs and oxygenation of the blood are less frequent and thorough. Metabolism is sluggish. Insufficient food is taken to supply the demands of the tissue for variety, and much of the food eaten may decompose in the intestine and produce toxic products."

Crowder² has made some very interesting experimental observations

¹ Journal American Medical Association, October 11, 1913.

² Archives of Internal Medicine, October, 1913.

on the effect of reinspired air. He points out that everyone, whether they sleep inside or outside, reinhales some of the air just exhaled, but also air contained in the nose and larger bronchi, the so-called dead-space air. This may amount to one-third of the whole volume in quiet inspiration, and not less than one-tenth in deep breathing. The result of Crowder's observations is to strengthen the belief that the main object of ventilation is not to remove chemical impurities by constant renewal of the air. The essential features of good ventilation are not the removal of carbon dioxide or other supposed noxious poisons, but are *coolness, dryness and motion*.

The various studies which have been contributed within the past few years on the physiology and mechanism of breathing are all of the greatest interest. They have not disproved, however, the immemorial fact that an out-door life is the natural one, and that the further we depart from this the more certain are we to pay the penalty in the way of various disorders, both functional and organic. Individuals who approximate this method of living are, for the most part, healthy, and in prescribing it for illness, whether acute or chronic, we utilize one of our most powerful assets in the treatment of disease. On the other hand, these studies will undoubtedly aid in the abandonment of expensive and complicated methods of ventilation, which, for the most part, do not accomplish their object.

There is perhaps no type of building in which a highly complicated ventilation system has been carried to such extremes as in the modern hospital. Everything that science could devise has been tried in these buildings, and with hardly an exception they have failed. Some years ago in PROGRESSIVE MEDICINE I quoted an observation of Gilman Thompson on the effect of fresh air in various diseases. He contrasted the results he obtained in two hospitals, one modern in construction with a highly developed ventilation system, the other an old building with loosely fitting windows which were incapable of entirely excluding the outside air. The contrast was all in favor of the latter.

I do not think there is any doubt but that a decided change is already taking place in hospital construction. Several of the most recently constructed buildings are essentially out-door hospitals, and patients of all classes, both surgical and medical, are for the most part kept out of doors. In this connection it may not be amiss to quote from the last published article of S. Weir Mitchell¹ in a reminiscence of the Medical Department during the Civil War: "When finally at times they (the hospitals) became too small for the care of abrupt additions from remote battles, we pitched tents around them, holding eight and ten cots, and quickly learned a new lesson, for it was found that patients with wounds and fevers did far better in these tents than in our best wards. The hint was readily taken, and elsewhere there arose hospitals composed of

¹ Journal American Medical Association, 1914.

nothing but tents, large or small, sheltering in one instance fifteen hundred inmates.

"You have rediscovered lately what in those days we knew perfectly well, that even pneumonia and bronchitis did best in tents no matter how bad the weather. My own little paper on "Camp Cure" dates from 1872. I believe now that a tent-hospital without permanent wards is a thing of the near future and will be quite well worth trial for small communities, and as an addition to larger permanent hospitals. If I were required to erect a small hospital near a country town in a temperate climate, I should try this very rational experiment. It should have electric underground wires and the best drainage—all laid as if for a built hospital, and over this should be placed well-floored tents."

This idea of Mitchell's was utilized last summer by the Babies Hospital, of Philadelphia. Necessity compelled the hospital to care for a certain number of cases of vaginitis, and having no other place to isolate these children they were placed in tents. While isolation and proper local treatment had much to do with the extraordinarily good results obtained, it was the consensus of opinion of those having the children in charge, that the open-air life had much to do with the favorable outcome.

The Elgin State Hospital for the Insane in Illinois¹ has recently adopted the sanatorium method for the treatment of the anemic and tuberculous insane. The report states that this department is the most comfortable, the easiest maintained and supervised, as well as the best ventilated and heated ward in any institution in Illinois; and, in addition, the patients have shown marked improvement, both mentally and physically.

The fresh-air treatment of *pneumonia* is now generally accepted. The various expedients which may be brought into play in order to place the patient in the proper environment, have been emphasized repeatedly in PROGRESSIVE MEDICINE. Fussell² has contributed the most recent article on the subject.

The results obtained in *surgical tuberculosis* from exposure of the patient to the direct rays of the sun is one of the comparatively recent innovations which has proved its worth. *Heliotherapy* (helios, the sun) as it is called, has been practised for several years in the Swiss Alps, but only recently in this country.

The method has attracted considerable notice, even in the lay journals, and many are familiar doubtless, with the pictures of children completely nude and playing out of doors in the snow. This seems like a very radical procedure, but the results apparently justify it.

Ganjoux³ summarizes the treatment as follows: The general rule is

¹ Institution Quarterly, 1913.

² Pennsylvania Medical Journal, February, 1914.

³ Annales de Médecine et Chirurgie Infantiles, June 1, 1914.

to begin with 5 or 10 minute exposures, increasing the length by a few minutes each day. At first only the feet are exposed. The surface exposed is gradually increased until finally it includes the abdomen and chest. The effect of the exposure should be noted carefully and suspended, resumed or intensified according to the individual response. The best results are obtained in superficial torpid lesions, in bone tuberculosis and painful gynecological affections. It is also beneficial in cases of pulmonary tuberculosis which remain stationary, but in those in which there is hectic fever or in the acute stages of the disease, the treatment is contra-indicated. Good results have also been obtained in cases of tuberculous nephritis, in cystitis, and in prostatitis. It is, of course, understood that entire dependence is not to be placed in the sun's rays alone. Cases of surgical tuberculosis, for instance, should receive whatever operative interference and immobilization that is necessary.

Hüssy¹ urges surgeons to abandon operative procedures for tuberculous lesions involving the hand and wrist and treat this form of tuberculosis with direct sunlight (heliotherapy). He reports 32 cases treated in this way. In 21, fistulas had already developed in the hand or wrist; in 29, lymph nodes were involved; in 12, the lungs, and in 25, other surgical tuberculous processes were present. The hand process healed completely under the systematic exposure to the mountain sunlight in 23 cases, and 1 other was much improved. The functional use of the hand was fully restored in nearly all. Eight others were still under treatment at the time of the report, although the hand had entirely healed. Three cases succumbed later to other forms of tuberculosis, but with no return of the trouble in the hand.

Hüssy emphasizes the fact that entire dependency cannot be placed on the sunlight alone. Heliotherapy, to be successful, must be applied by physicians trained in orthopedic and surgical procedures, as otherwise the orthopedic side of the treatment, punctures, proper position of the affected part, etc., will be neglected. In his judgment, patients suffering with surgical tuberculosis should be brought out of the sick room and treated in the light and air.

The short time which patients are exposed to the sun's rays serves to emphasize the fact that prolonged exposure in sun light is not only undesirable, but that it is not without danger. It is known that such a procedure is capable of producing various nervous conditions in addition to bringing about an increase in the fever. For many years sunlight was considered the *sine qua non* in the treatment of tuberculosis, and it was believed that it was not possible to have too much of it. While not universally accepted, it is becoming recognized more and more that although sunlight is advantageous, exposure too continuously to the direct rays of the sun may be actually harmful.

¹ Beiträge zur Klinischen Chirurgie, May, 1914.

A recent editorial article¹ calls attention to the fact that it is necessary to distinguish between an environment which has fresh air and ample light, as compared to one with a maximum of sunlight. A dark, windowless room is unquestionably a bad thing. On the other hand, there is no reason for assuming that the opposite extreme, namely, continuous exposure to the sun's rays should be obtained at all costs.

Burker² whose studies on the effect of *altitude* on the blood were briefly considered last year, has published his results in detail. His studies seem to indicate unquestionably that altitude does increase both the number of red cells and the hemoglobin content, and that this increase is an absolute one, not merely relative. The red cells increased from 4 to 11.5 per cent. and the hemoglobin from 7 to 10 per cent. Nearly all observers who have studied this subject have noted that the adjustment of the blood to the new atmospheric conditions occurs promptly. There is a rapid initial increase of the elements involved, followed by a gradual continuation of the effect. When the individual returns to lower levels, however, there is a diminution, but the decrease does not occur so rapidly.

Schneider³ reports a study on the same subject. His report deals with observations made on a man who had resided for seventeen years at an altitude of over fourteen thousand feet. The hemoglobin content of this man decreased very slowly after a descent to a lower level at the end of six months' stay; the percentage falling from 148 to 132 in thirty days, and to 122 during the following six weeks spent at a lower altitude. The number of corpuscles decreased from 7,700,000 to 7,000,000 while the total volume of the blood showed an increase of 5.4 per cent. on the sixth day, and a maximum of 7.5 per cent. on the thirtieth day.

Another interesting observation on this man was the fact that for a period of six years the arterial pressure has remained normal. Schneider does not agree with those who believe that the chest is greatly enlarged by residence at high altitudes. He insists that the vital capacity and chest measurements are not greater than of men of similar physique at sea level.

Schrumpf⁴ has contributed an interesting article on the effect of high altitudes in disease of the *heart and bloodvessels*. He considers altitudes only up to 7000 feet. The general impression is that a high altitude is contra-indicated in any form of heart disease, because of the belief that blood-pressure is increased by such altitudes. Schrumpf, on the contrary, has shown that abnormal pressures are improved; thus, high pressures are lowered, and low pressures are raised, and, in addition, the general condition is improved. He believes that a high altitude is actually indicated in some form of heart disturbance. Among

¹ American Medicine, July, 1914.

² Zeitschrift f. Biologie, lxi, 1913.

³ American Journal of Physiology, 1913, xxxii.

⁴ Deutsche Archiv. f. klinische Medizin, 1914, cxiii.

such conditions he includes anemia, sclerosis, too rapid growth in adolescence, general asthenia, toxemias, gouty conditions, mild atherosclerosis, fatty heart, nervous arrhythmic and vasomotor neuroses. Compensated valvular lesions and mild cases of myocarditis were also favorably affected. A high altitude is contra-indicated in cases of compensation and coronary sclerosis. Schrumpf warns against abrupt changes from a low to a high level, and also advises complete rest for a few days upon reaching the high altitude.

While there can be no doubt that the fear of increasing the blood-pressure is a danger that has been overestimated, one cannot deny the fact that many individuals are adversely affected by even moderately high altitudes. I have encountered several instances in which very annoying cardiac symptoms arose from residence at an altitude of 2000 feet. Return to a lower level brought complete relief.

Exercise. The value of rest in the treatment of disease has been recognized for years and for this simple physiological fact we are indebted to Weir Mitchell whose monograph on the subject, published nearly forty years ago, is now one of the medical classics. The other extreme, namely, the employment of exercise or work has been less used, although of recent years it is receiving more and more attention. Thus graduated labor in the management of tuberculous patients has been tried extensively, and the need of employment of some sort is becoming more and more a necessity in the treatment of mental and functional nervous diseases. Gorrito¹ has recently given his results from the use of employment in the case of the insane. His method is as follows: Should the patient be considered fit for work, and should it appear from the notes of his case that before his illness he followed some definite occupation, *e. g.*, that of carpenter, cobbler, tailor, plumber, mason, etc., he is put to work at it under expert direction. Should he have had no trade, he is, as a rule, put at out-door work of some kind, such as farming, gardening, care of poultry, cattle, pigs, etc. The patients are constantly visited by a physician while at work, who notes their condition and prescribes the amount each individual is capable of doing. It is, of course, understood that before being placed among other patients each individual is studied with reference to the point as to whether he would prove dangerous.

Gorrito enumerates some of the chief benefits of the method as follows: (1) A diminution of agitation and motor excitability with a corresponding improvement in the patient's sleep, which becomes quiet and restful and longer in duration. (2) A postponement, in chronic cases, or a complete escape from the onset of a condition of total dementia. This Gorrito ascribes to the beneficial action of the slight intellectual exercise involved in the occupation followed. (3) A return of the power to work, the importance of which, especially when there is added

¹ La Semana Medica, Abstract Lancet, May 2, 1914.

to it a practised acquaintance with some definite occupation, can hardly be overestimated in the case of patients sufficiently recovered to leave the asylum or return to active life.

There is constantly increasing belief that the various athletic sports can be carried to excess, that is from the stand-point of injury. Butsch¹ has suggested the formation of a sort of "scale" whereby one could determine the relative likelihood of damage or injury to be encountered in the various athletic pastimes. Thus if the statistics of accidents in athletics, and the personal harm known to result all too often, could be gathered in some way for purposes of public contrast, the physician and physical culture teacher could advise more intelligently regarding the desirability of participation.

That there is need of greater care in the supervision of young men engaged in athletic contests, there can be no doubt. Within the past year a young man has been under my care who was allowed to compete in relay races, and who had had for some time an active apical tuberculosis. As the boy complained of feeling bad during this period, there does not seem to be much excuse for allowing him to continue without a thorough physical examination.

Coughlin² states that it has been proved beyond question that immoderate college athletics lead to a physiological *hypertrophy of the heart*. At first the hypertrophy is physiological for the heart muscle as any other muscle or group of muscles enlarges, as the result of systematic exercise. Providing the use of the muscle is not abnormal, no serious ill effect is likely to occur, but if prolonged, and, in addition, the heart is put to the strain of severe athletic contests, Coughlin states that dilatation of varying degrees, frequently associated with valvular insufficiency, is apt to occur. Acute cardiac dilatation occurs more frequently in athletes and men used to severe muscular strain than in normal men, and the effects are more prolonged and severe.

Coughlin states that carefully collected statistics show that deaths of athletes are caused by the following diseases in order of their frequency: cardiac disease, tuberculosis, typhoid fever, pneumonia and Bright's disease. The games indulged in with fatalities in the order of the greatest danger are said to be foot-ball, base-ball, and boxing.

While at the present time the after-effects on the heart of severe muscular exertion are pretty well understood, not much is known about the immediate effects. As a result of improved technique in the use of the fluoroscope, much more accurate information regarding the behavior of the heart during and immediately after exercise is now possible.

Zuntz and Nicolai³ have devised a scheme for making observations by means of a stationary ergometer directly on the human subject during the period of work. From measurements made in this way they

¹ Berliner klin. Wochenschrift, January 9, 1914.

² Medical Record, August 8, 1914. ³ Berliner klin. Wochenschrift, May 4, 1914.

find that during exercise the heart becomes slightly enlarged, but immediately thereafter it is suddenly reduced in size below the normal. Because of this they believe that ordinarily the heart contains a small undischarged residue of blood which is expelled under the conditions immediately succeeding the cessation of work. An editorial comment¹ suggests that the residual blood remaining in the ventricle after a normal systole may be looked on as a reserve supply to meet any emergency call which may suddenly arise in some distant organ, for in such an event the dilatation of these peripheral vessels and the consequent more ready passage of blood would lead to a fall in blood-pressure in the aorta. Obviously, under these conditions, a constant systolic efficiency would permit a more complete discharge from the ventricle in the face of decreased peripheral resistance.

In regard to the possible evil effects of college athletics, there is another feature to be considered. Young men indulging in competitive college athletics devote a great deal of time to exercise. Upon graduating from college, they take up a business career, or enter one of the professional schools. The majority abruptly cease taking any exercise whatever, and, as a result of the lack of exercise and days spent in confined quarters, they rapidly lose condition. They are probably for this reason more susceptible to a physical breakdown than is the case with those whose manner of living differs but little from what they followed while in college. A muscle, such as the heart muscle, which has become slightly hypertrophied from exercise will eventually lose its tone, if it is not kept in condition by judicious exercise.

Another feature of exercise which more nearly concerns the general practitioner is that which should be prescribed for the business or professional man whose occupation entails a great deal of brain work and nervous fatigue. It is a very common practice among men of these classes to take relatively violent exercise late in the afternoon in the athletic or semi-athletic clubs of our large cities. Usually this is done of their own accord with the belief that they are doing the right thing; very often, however, the playing of squash or racquets is prescribed for these men by physicians. The result is that in many cases physical fatigue is added to the nervous fatigue. Under these circumstances, the most rational procedure would be complete relaxation. The best form of exercise for men of this type is walking in the open air or playing golf several times a week. In both instances, they are kept in the fresh outside air taking a mild form of exercise as opposed to a somewhat violent form of exertion in a squash court, which is, at best, imperfectly ventilated.

Friedmann's Cure. It is to the credit of the medical profession of this country that it refused to be swept off its feet by the extravagant claims made for this alleged cure for *tuberculosis*. The subject was

¹ Journal American Medical Association, July 25, 1914.

reviewed *in extenso* in last year's PROGRESSIVE MEDICINE, and while there still lacked at that time, complete proof of its inefficiency, there was every reason to believe that it was not only worthless, but actually dangerous. While it is true that no one of any scientific standing in this country was willing to indorse the treatment, it must be acknowledged that there were some who inclined favorably toward Friedmann, and who at least hoped the treatment would prove to be what was claimed for it. As was pointed out last year, Friedmann's claims would have caused nothing more than a passing interest had it not been for the carefully planned campaign carried on in the lay press. This so aroused the hopes and credulity of tuberculosis sufferers throughout the country that public opinion practically forced the Government, through the agency of the Marine Hospital Service, to give some recognition of the treatment. Brauer,¹ in an emphatic protest against the use of Friedmann's remedy, states that at first it could not be obtained in Germany for individual control research, but when they were able to investigate the cure, the conclusions were almost universally negative, and in agreement with the unfavorable reports which came from America. He furthermore asserts that communications made to him verbally, and by letter, indicate that the adverse verdict is even more universal, and unanimous than is shown by what has been published in the leading medical journals. Brauer reiterates in conclusion that it is to be hoped in the interests of the tranquil and steady development of German medical science and of the health and peace of mind of the sick, that the sensational agitation over the Friedmann tuberculosis treatment will disappear from scientific journals, and, above all, from the newspapers. He appeals to the medical advisers of the daily papers to use their influence to keep out of the papers communications on half-baked or sensational medical matters apt to arouse misleading hopes in the general public, or at least to publish such items in a form suggesting critical suspension of judgment on the matter.

In spite of the adverse report of the medical officers of the Marine Hospital Service, and of others having under their care patients who had been subjected to the treatment, there were a few who refused to be thoroughly convinced that this so-called cure was a failure. As a result of additional adverse reports in this country and of a number in Germany, it can now be said with no danger of contradiction, that the Friedmann cure stands utterly discredited.

The feeling entertained by some that even though the treatment might prove unsuccessful, it was at least harmless, has been disproved by some experiments and observations published by Lydia Rabinowitsch.² This observer found that of guinea-pigs injected with acid-proof bacilli from Friedmann's vaccine, some developed small foci with bacilli in

¹ Beitrage zur klinik des Tuberculose, No. 2, vol. xxxi.

² Deutsche. med. Wochenschrift, 1914, xl.

them, and that one presented the characteristic picture of tuberculosis produced by the inoculation of feebly virulent tubercle bacilli of the mammalian type. Rabbits injected with large quantities showed slight changes.

Rabinowitsch also showed that the vaccine is far from being carefully prepared. In a large proportion of the samples examined, she found streptococci which were pathogenic for guinea-pigs.

Vulpins and Laubenheimer¹ state that in only two out of thirteen ampules examined by them was the turtle bacillus in pure culture. All the other samples were contaminated with organisms of different kinds, including a staphylococcus aureus, which proved very virulent on inoculation with animals.

Bierman² had a similar experience in regard to contamination.

These observations seem to indicate conclusively that Friedmann's so-called cure is not only subject to contamination with various pathogenic bacteria, but also may contain tubercle bacilli pathogenic for guinea-pigs and rabbits, and also for human beings.

These bacteriological findings also explain the great frequency of local abscess formation following an injection of the vaccine. Of 31 patients given intramuscular injection by Vulpins and Laubenheimer, infiltration, followed by a fistula, occurred in eight. Bischoff and Schmitz³ report 1 case in which the injection of Friedmann's vaccine was followed by a chronic suppurating bilateral mastitis. Bacteriological examination of the pus showed bacilli which resembled in every way, the turtle bacillus. Vulpins and Laubenheimer also report one fatality following the use of the vaccine, and Gangele and Schussler⁴ record one case in which death from miliary tuberculosis was apparently hastened by the treatment.

Reports unfavorable to the use of the vaccine have been made by Vulpins and Lauberheimer,⁵ who report 46 cases treated; L. Brauer,⁶ Hegler,⁷ Gangele and Schussler,⁸ 34 children; Karelowski,⁹ Wichmann,¹⁰ 7 cases of lupus; Steinitz,¹¹ 20 cases of pulmonary tuberculosis; Friedländer,¹² 8 children; Schittenhelm and Wiedemann,¹³ 40 cases of various forms of tuberculosis; Rosenfeld 43 cases of pulmonary tuberculosis.

The Friedmann cure is no exception to the rule that even a bad cause is not without reputable supporters. From the very first Friedmann

¹ Deutsche med. Wochenschrift, February 26, 1914.

² Ibid., April 23, 1914.

³ Medizinische Klinik, July 7, 1914.

⁴ Ibid., April 23, 1914.

⁵ Deutsche. med. Wochenschrift, February 26, 1914.

⁶ Ibid., April 23, 1914.

⁷ Ibid.

⁸ Ibid.

⁹ Berliner klin. Wochenschrift, June 1 and 8, 1914.

¹⁰ Ibid.

¹¹ Ibid.

¹² Wiener klin. Wochenschrift, May 21, 1914.

¹³ Münchener med. Wochenschrift, May 12, 1914.

had the support of Schleich and several others of established reputation. The endorsement of Schleich, the discoverer of local anesthesia, undoubtedly carried great weight, and even now is referred to as evidence in favor of the treatment. Even after Friedmann's disastrous (professionally, but not financially), American visit, Schleich¹ and several others reported and showed cases at a medical meeting as having been markedly benefited from the use of the vaccine. Opposed to them, however, is the majority of German physicians, if we can judge from the published articles mentioned above. Thus Schittenhelm and Wiedemann² state that "we believe positively that the few apparently favorable results which we have to chronicle in pulmonary tuberculosis could have been attained with other measures. But we regard the danger of the treatment so great that we shall not apply it further. This judgment is not qualified by the favorable result in these joint cases. Such observations call for experimental following up of the subject; but they cannot justify the further therapeutic application of the remedy which has won disrepute in the majority of the cases by its failure to benefit and its harmfulness."

What amounts to an official stamp of disapproval is the opinion expressed by an editorial in the *Münchener medizinische Wochenschrift* (June 16, 1914). This editorial states that never in the history of medicine has there been such a unanimous verdict of repudiation of an alleged curative measure as in the case of Friedmann's remedy. The general verdict is that, on account of the lack of any pronounced curative action from it, and of the dangers connected with it, its use is warned against. In conclusion, the editorial states that as the status of the remedy seems now definitely settled, no more space will be devoted to it in the future.

The American verdict is well expressed in an editorial article³ which cites the following facts:

1. Dr. Mannheimer reported on the results of 18 cases in New York in which the Friedmann "treatment" was used, and stated that in not a single one of the 18 cases was there definite improvement to date that could be attributed to the "treatment."

2. A committee of some of the foremost physicians of Canada was appointed to watch the patients inoculated by Dr. Friedmann in the Canadian hospitals. These physicians made a similarly unfavorable report.

3. Dr. Anderson, acting under the authority of the United States Government, watched the progress of the patients treated by Dr. Friedmann in this country. He also gave an unfavorable opinion as to the effect of the treatment.

¹ Berliner klin. Wochenschrift, November 10, 1914.

² Loc. cit.

³ Journal American Medical Association, September 13, 1913.

4. The Friedmann "treatment" has been condemned by German physicians generally.

5. A report from the Rhode Island State Sanatorium on the results in 120 patients treated by the Friedmann method states that the patients "have shown none of the immediate and wonderful results reported by Friedmann," but that, "on the contrary, about 17 per cent. of the cases" are worse than they might have been expected to be under ordinary sanatorium treatment.

Fuchsin. The use of this aniline product in the treatment of *leg ulcers* was first recommended by May and Heidingsfeld.¹ As a result of this experience they stated the fuchsin was absolutely non-irritant and non-toxic, did not coagulate albumin, and encouraged epithelial and granulation growth. Donnelly² has given the treatment a thorough trial and enthusiastically endorses it.

Commercial fuchsin should not be used, and, in ordering the dye, Grubler's fuchsin für bakterien should be insisted on. The formula is as follows:

Fuchsin	1 part
Petrolatum	5 parts
Lanolin	q. s. ad. 100 parts

This makes a fine, smooth paste which does not melt and run away or soak through the dressing.

Donnelly states that of 30 cases of leg ulcer occurring in motormen, between June 1 and December 15, 1913, only one failed to respond to the fuchsin. Encouraged by the results obtained with the leg ulcers he extended the use of the fuchsin to burns, abrasions, denuded matrices of evulsed nails, ingrowing toenail operations and to all conditions in which there was ulceration or loss of epithelial covering. In burns, the results were especially gratifying, particularly electric burns. He has employed the fuchsin paste in 92 cases of the above-mentioned conditions, and, with the exception of one leg ulcer, the results have been uniformly good.

The only objection to the treatment is the bright red color of the dye and the difficulty of removing the stain from the hands and clothing.

Hexamethylenamin. The discovery that this drug was an efficient *urinary antiseptic* in many instances, and the work of Crowe and others showing that hexamethylenamin passes into all the tissues and body fluids led to its employment in a variety of conditions. Later laboratory workers showed that the activity of hexamethylenamin depends on its breaking up into formaldehyde and ammonia; and, furthermore, that this can take place only in an acid medium.

¹ Journal American Medical Association, May 31, 1913.

² Ibid., February 14, 1914.

Hanzlik¹ has found that while hexamethylenamin itself can be detected in all the body fluids, free formaldehyde does not appear in any of the body fluids which are neutral or truly alkaline. The alkaline or neutral fluids include the blood, cerebrospinal, pleural, pericardial and synovial fluids, aqueous and vitreous humors, saliva, bile and some urines. Urine is the only body fluid, except gastric juice, which is truly acid, and it is here only that liberation of formaldehyde from hexamethylenamin can take place. The same holds true of pathological fluids. Hanzlik states that hexamethylenamin acts as an antiseptic only in proportion as it liberates formaldehyde and that this liberation can occur only when the reaction is acid. It is only in vesico-urinary conditions, therefore, that one can expect any beneficial therapeutic action from the administration of hexamethylenamin, because the urine is the only fluid which is acid, or, if alkaline, the only one which can be altered to an acid reaction. No favorable effect is to be expected in infections involving the other body fluids. Nor, on account of the rapid absorption of the drug, and of this usual alkalinity of the bowel contents, is a bactericidal action to be expected in the intestinal canal.

If the urine is alkaline, it may be rendered acid by the administration of acid sodium phosphate (monosodium phosphate, NaH_2PO_4), until the urine, when tested with the phloroglucin reagent, gives a reaction for formaldehyde. The administration of 13 grams (200 grains) of the acid sodium phosphate will render the urine acid within five hours. If diarrhea occurs and is troublesome, the phosphate may be reduced. The administration of alkalies, such as sodium bicarbonate or potassium citrate, entirely counteracts the action of hexamethylenamin in bladder conditions. For this reason these drugs should never be prescribed together.

In another study on the effect of hexamethylenamin, Hanzlik and Collins² investigated, among other things, the antiseptic action of the drug independently of the formation of formaldehyde. They found that on adding the hexamethylenamin to various liquids inoculated with bacteria, that an antiseptic effect was obtained only when a sufficient quantity of formaldehyde was liberated. If this was prevented, even very high concentrations of hexamethylenamin were ineffective.

Hinman,³ in a study of the value of hexamethylenamin as an internal antiseptic in other fluids of the body than urine, concludes that; hexamethylenamin is dependent on the liberation of formaldehyde for its antiseptic value. As it is not converted into formaldehyde in any of the normal alkaline fluids of the body, it can be of no prophylactic value in any of these fluids. After some infections of these alkaline fluids, there may be, under certain conditions, a change in reaction sufficient to produce slight liberation of formaldehyde, but it is not possible to show

¹ Cleveland Medical Journal, December, 1913.

² Archives of Internal Medicine, November, 1913.

³ Ibid., June, 1914.

that there would be enough to give antisepsis. In localized infections of pronounced acidity, hexamethylenamin is not taken into them from the circulation in amounts to furnish formaldehyde in antiseptic strength (the gall-bladder, possibly, excepted).

The therapeutic use of hexamethylenamin as an internal antiseptic is justified, experimentally, for urinary conditions alone, and then only when it is excreted into an acid urine.

Walker¹ advises that the dosage of urotropin be increased until an antiseptic action is obtained, or the limits of tolerance are reached. The reaction of the urine should be carefully noted and the acidity raised if necessary until the point of dissociation of hexamethylenamin is reached. Inasmuch as diuretics and diuretic waters interfere with the splitting of hexamethylenamin they should be avoided during its administration. The Rimini-Burnain test for formaldehyde should be in constant use during the time the drug is being administered. In Walker's opinion antiseptics of the formaldehyde series are harmful or useless in very acute inflammation of the urinary organs, in pure tuberculous infection of the urinary organs, and when the urine is alkaline.

Another experimental study on the action of hexamethylenamin has been reported by McGuigan and Hess.² These observers found that after the administration of the drug, free formaldehyde appears only in the gastric juice and acid urine, and not in other secretions or in the blood, even with dialyzing tests, the liberation results from the acid reaction only and not from cell action. Even if it were liberated in other locations it would probably exert no beneficial action, because of its reconversion or rapid oxidation into injurious products. Combined formaldehyde as hexamethylenamin does not decompose readily until an acid medium is reached, when the action is that of weak formaldehyde. The only apparent indication for the internal administration of the drug, therefore, is in infections of the urinary tract.

In a report on various urinary antiseptics, Jordan³ states that the use of hexamethylenamin (together with acid sodium phosphate) as a prophylactic before an operation or procedure where the urine may become infected is of the utmost value, since if the urine is clean and highly acid, and sufficient hexamethylenamin is given in small doses to keep it constantly acid, the urine will not support the life of any organism, and becomes indeed a powerful antiseptic fluid. The drug should never be given except when the urine is acid or can be made so. The acidity of the urine should be tested during the administration of hexamethylenamin, as the drug will not act efficiently unless this reaction is present. The more acid the urine, the greater is the decomposition of urotropin and excretion of formaldehyde.

¹ Edinburgh Medical Journal, June, 1914. ² Arch. of Int. Med., November, 1913.

³ British Medical Journal, September 13, 1913.

In a study of the effects of hexamethylenamin in the urine of children, Talbot and Sisson¹ arrive at the same conclusions at those who have studied its effects in adults.

As a result of these observations, "It may therefore be affirmed that under ordinary conditions the only part of the body in which hexamethylenamin may be expected to exert an antiseptic action is the urinary tract. Extensions of the use of hexamethylenamin therapy to other organs must be abandoned as useless. Even as a urinary antiseptic, the drug is useless unless the urine is acid; if it is not already acid, sodium acid phosphate should be administered to render it so. Substances which tend to render the urine alkaline are physiologically incompatible with hexamethylenamin, and, if administered in sufficient quantity to overcome the acidity of the urine, will entirely destroy the effect of the latter drug."²

It has been recognized for some time that, while of infrequent occurrence, *hematuria* may arise during the administration of hexamethylenamin. Belowski³ during the past year has reported 4 cases, 1 of which occurred in a fatal case of typhoid fever. In this case the lesions found at the autopsy were confined to the bladder, the kidneys showing no changes whatever. These 4 cases occurred among 40 cases of typhoid fever patients who were given doses of 7 or 8 grains of hexamethylenamin three or four times daily. The hematuria stopped when the drug was discontinued.

In view of the fact that sodium bicarbonate or potassium citrate prevent the action of hexamethylenamin, one or the other of these drugs should be given whenever evidences of vesical irritation arises during the administration of the hexamethylenamin.

Hydrotherapy. In proportion to the benefits to be derived from the therapeutic uses of water, there is no subject which has been more neglected by American physicians. The subject assumes unusual importance at the present time, because of the war now raging in Europe. Irrespective of the time the war is apt to last, it is bound to have an influence for some time to come on the annual American migration to the European spas. The supposed benefits of these pilgrimages to foreign watering places have amounted to a mania on the part of well-to-do Americans of the past two or three generations. It has been recognized always, and freely admitted, that, so far as the medicinal advantages of the foreign spas are concerned, they had nothing to offer that could not be obtained in this country. If this is true, how are we to explain the comparative neglect of American resorts? There seem to be two reasons: (1) The undeniable fact that every effort is made to

¹ Boston Medical and Surgical Journal, April 3, 1913.

² Editorial, Journal American Medical Association, January 3, 1914.

³ Revue de Médecine, August, 1913.

please and amuse the visitor in the foreign resorts. I have had people tell me that what would be an irksome duty in this country is made agreeable abroad. (2) The subject of hydrotherapy in all its phases has been made a special study by foreign physicians, while in this country there are very few men who have a thorough scientific grasp of the subject. Thus, in the medical schools, the subject is either neglected entirely, or treated in a very superficial manner.

Baruch,¹ who has made a study of hydrotherapy for years, and who is easily the leading authority on the subject in this country, has contributed an interesting article on the need of instruction in the remedial uses of water. He points out how vague and fragmentary most of the advice relating to hydrotherapy is in the majority of the modern text-books.

Baruch classifies the uses of water under the following headings: Stimulants, sedatives, tonics, diaphoretics, diuretics, cathartics, anti-septics, local anesthesia and mineral springs. I quote in full his brief resume of the various effects produced by water:

“*Stimulants.* (a) The most pathetic and striking form of asthenia is the stillborn infant. Here alcohol and medicinal stimulants are never used because they are absolutely inert, and rapid action is demanded to save life. The stimulant *par excellence* in this emergency is cold water.

“(b) When vitality is flagging in the typhoid patient and all stimulants fail, a complete transformation is often observed after the judicious application of a cold water procedure. Who that has ever adopted the latter has not seen the dull eye regain its lost luster, the suffused skin turn pink, the apathetic countenance become bright, the feeble, rapid pulse restored to better tension? No other stimulant is capable of such rapid and effective action.

“(c) What is the external stimulant in common use for frost-bite—a local asthenia? Cold applications are here also the effective agents.

“*Sedatives.* Singular paradox though it may appear, water is a most efficient sedative, also.

“(a) Every tyro in practice applies the warm bath in eclampsias when practicable, and orders it for insomnia quite often.

“(b) The great London clinician, Sir William Broadbent, tells us that “sound, refreshing sleep is produced in delirium tremens by cold affusions.”

“(c) The most striking testimony to the sedative properties of water is the almost universal asylum practice of submerging maniacal patients in the tepid continuous (Hammock) bath for prolonged periods. In many of these institutions, artificial restraint and powerful narcotics have been displaced by this procedure.

¹ Therapeutic Gazette, November, 1913.

"Tonics. The literature of internal medicine abounds in evidence that certain cold-water procedures produce definite effects upon appetite, digestion and assimilation.

"The transactions of the New York State Medical Society for 1892 contain detailed brief histories of many cases treated in the Montefiore Hospital in New York in which remarkable gains in weight and general invigoration resulted from the neurovascular training, a method requiring reaction after each cold procedure, without which "cold applications are a physiological crime." (Fortescue Fox.)

"Diaphoretics. The hot bath is recommended in every text-book as a diaphoretic. The technique of hydrotherapy offers certain procedures which are quite as effective in this regard as the Turkish bath. There is only one reliable medicinal diaphoretic, pilocarpine. The latter is useless in rheumatism and gout, while the former is ineffective in giant edema; each has its place in the *materia medica*.

"Diuretics. Here I must ask you to depend upon my personal observation as proof that small quantities of ice-water regularly administered every half-hour induce powerful diuretic action.

"Cathartics. As an evacuant of the intestinal canal, the enema is an orthodox remedy. The modern irrigation is so far superior to the conventional laxatives in some diseases like infantile diarrhea that the inferior action of water as a purgative is compensated.

"Antiseptic. Is there any medicinal agent superior to hot water properly applied in the production of asepsis? Lawson Tait was probably the first to give hot water the preference over poisonous antiseptic drugs.

"Local Anesthesia. Many of you have, like myself, seen tumors removed and other surgical operations performed by the Schleich method without pain.

"Mineral Springs. A word about the mineral springs which nature has provided in almost all parts of the globe. These springs have become popular through their therapeutic value, but they are rarely described in specific terms by physicians. It is high time that students and physicians become better versed in their remedial capacity through instruction in the schools. At present the physician and patient are left to the tender mercies of the health-resort doctor, who is not always dependable in practical medicine.

"In France, the waters of Vichy, Aix-le-Bains, and many springs of lesser importance; in Germany, Carlsbad, Nauheim, Kissingen, Marienbad, Kreuznach, and numerous others; in England, Bath, Harrogate, and Buxton, have been analyzed by reliable chemists and studied so many years theoretically and clinically. How many physicians avail themselves of this accumulated knowledge?

"In my own country, Saratoga Springs, the Hot Springs of Arkansas, Mount Clemens, and a large number of others offer a fertile therapeutic

field which has not been cultivated sufficiently. No wonder that foreign writers of balneology do not take these valuable American springs seriously. It may be of interest to this world-wide audience to learn that the Hot Springs of Arkansas and the cold springs of Saratoga are now under governemnt management, and that their analyses are absolutely reliable."

The brief *resume* given by Baruch serves to indicate the conditions in which hydrotherapy is serviceable. The details for carrying out the various procedures can be obtained in any one of several standard text-books on the subject. In addition, most of the recent text-books on therapeutics consider the subject of hydrotherapy very comprehensively.

Another very interesting article on the subject of hydrotherapy, and one that contains much detailed information, has been contributed by Pope¹ who deals with the subject of nervous fatigue or neurasthenia.

Patients of this type must be treated by general systemic measures the object of which is to remove the underlying cause of the trouble, and at the same time to strengthen and tone up the nervous system. At the same time it is necessary to symptomatically treat special symptoms, such as headache, backache, insomnia, anorexia, indigestion, constipation, etc. The treatment may be carried out in the home, or in sanatoria or hospitals. In Pope's opinion, and in this I think every one will agree with him, the hospital or sanatorium is the only place in which one is apt to succeed with these patients. Generally speaking, failure almost always results from trying to treat this type of case in the home.

Of the physical measures available, Pope places hydrotherapy first.

As the result of his experience with hydrotherapy, not alone in nervous fatigue, but also in a variety of functional and organic disorders, Pope believes that failure to employ it, is in a sense, a medical crime. "It is too valuable and important a remedy, too far reaching and useful, to be relegated to the charlatan, quack and that abomination of all hydriatists, the 'giver of baths.' Hydrotherapy belongs to the medical profession; it is a scientific measure, capable of scientific application, and must never again be allowed to drift to destruction on the rocks of therapeutic nihilism."

The general method of utilizing hydrotherapy in the home and in institutions is briefly outlined by Pope as follows:

"(a) A plan suitable for the home or for those whose reaction is poor. Dry-pack for from one-half to one hour, followed by a cold sponge with water at a temperature of 70° F. for three minutes, with vigorous friction. As soon as this point is reached, dispense with the dry-pack and give the dripping-sheet at 65° F. for three minutes with good friction, while the patient stands in a foot-tub of water as hot as can be borne. Reaction must be secured. This treatment is generally administered in the morning, and when this time is selected, give the general wet

¹ Journal American Medical Association, September 13, 1913.

pack at 65° F. for one hour at bedtime. When the patient is removed from the pack, he is rapidly dried and no reaction is sought. The advantage of this method of treatment is to obtain the stimulating and tonic influences of the dripping-sheet in the morning and the sedative and sleep-producing effects of the wet-pack at bedtime.

"Another good method is to have the patient sit in a half-bath with water at from 102° to 104° F., while the attendant gives him an affusion at 80° F. At this point the patient should stand in the tub in water as hot as can be borne, while the affusion is given to the entire body, or the water is thrown with force against the body from a large dipper. This may be further modified by first immersing the body in warm water, then giving a salt rub or glow, followed by the affusion. The warm full bath (104° to 105° F.) for 5 or 7 minutes, followed by the salt rub and finally by the cold shower at from 70° to 65° F., will be found useful. Reaction is essential.

"(b) In institutions or sanatoriums many women and nearly all men may commence with the following, particularly if the patient is up and going about: Electric-light bath or hot-air bath until perspiration commences, followed by the circular or horizontal rain-bath at from 100° to 104° F. for one and one-half to two minutes, reduced to 75° F. for one-fourth minute, with a pressure of 20 pounds. Reduce the temperature 3° daily to 60° F. and increase the pressure 2 pounds daily until 30 is registered. After about a week of this treatment we may add to the foregoing the fan douche at a temperature of 60° F. to the entire body for from five to ten seconds. The next move should be the following: Electric-light or hot-air bath until perspiration takes place, followed by the horizontal or circular rain-bath at 100° to 104° F. for one minute, reduced to 60° F. for from fifteen to twenty seconds, pressure 30 pounds, to be followed by the jet douche to the spine and legs at 60° F. for five seconds. An excellent method of treating these cases, after reaction has been well established, is to apply the jet douche to the spine at a temperature of 105° F. for a half to one minute, followed by the jet to the spine at a temperature of 60° F. for ten seconds, increasing the temperature of the hot water 2° daily until 110° or even 120° F. is reached, at which point it will usually be found that the patient can tolerate no higher temperature. This is especially useful in men who are physically strong and who complain of persistent 'head feelings' and tender spine. Neurasthenics do not, as a rule, stand the Scotch douche well. Certain prominent symptoms often demand special attention."

Iodine. The value of iodine in the form of the tincture as a *skin disinfectant* is now universally recognized. Frank,¹ from both experimental and clinical observations, concludes that although the tincture of iodine

¹ American Journal of Obstetrics and Diseases of Women and Children, November, 1913.

is an effective agent for sterilizing the skin, it has, however, some disadvantages. Thus in abdominal operations, should the intestines come in contact with the iodine, adhesions are apt to result, due to the action of the iodine as an irritant to the peritoneum. For this reason he urges that the utmost care should be taken by means of moist pads, to see that the intestines do not come in contact with the iodine. Under no circumstances should any of the tincture be allowed to enter the peritoneal cavity.

Waters¹ has found tincture of iodine an excellent agent for the prevention of infected *vaccination* wounds. The arm is painted with tincture of iodine, and at the same time the vaccinator, as he holds the arm, paints his left thumb. The lancet blade is dipped in the tincture and allowed to dry. A sufficient quantity of lymph is then extracted from the tube with the sterilized lancet, and either placed directly on the arm, or on the left thumb-nail of the operator. The vaccination is then performed through the iodined skin, and no dressing is applied. He has employed this method in 300 cases with many failures to take, but without sore arms. An improvement in the method is the painting of the vaccinated area with iodine, twenty-four hours after vaccination and repeating it once daily. Waters states that an experience with several hundred thousand cases has shown this method to be a most efficient preventive of infected vaccination arms.

The eradication of *gonorrhea in women* is extremely uncertain owing to the difficulty of reaching the infecting organisms and also because of the length of time necessary to effect a cure. Hartz² has found that iodine is a very valuable agent in gonococcal infections of the lower genital tract, in that it offers a more rapid, more thorough and a more permanent improvement in the patient's conditions than most other methods commonly in use. The gonococci disappear early from the secretions, intrapelvic extension is far less frequent; the use of the cautery and strong caustics is obviated, and hence less scarring results. Furthermore, the constitutional condition of the patient improves, as a result of the early cessation of the profuse discharge, and the rapid improvement and lack of pain noticed by the patient encourage her to continue with the treatment. The entire course of treatment is of comparatively short duration (18 to 25 cases cured in from four to ten weeks), and but little burdensome to the patient and physician. The treatment can be applied readily both in dispensary and private practice.

In acute and subacute cases where *vaginitis* or *vulvitis* is present, Hartz directs that the patient use one teaspoonful of liquor iodidi compositus (United States Pharmacopoeia) to two quarts of warm water as a douche twice daily. In the chronic inflammatory cases, the strength

¹ Indian Medical Gazette, September, 1913.

² American Journal of Obstetrics and Diseases of Women and Children, April, 1914.

is gradually increased to one or two teaspoonsful until the patient begins to experience a burning or smarting sensation, indicating the limit of increase.

The cervix was the most frequent site of lodgment of the gonococcus and because of the deep penetration of the organism into the cervical glands, it was found quite difficult to eradicate them. These patients are treated twice weekly through a bivalve speculum, with Lugol's solution in full strength carried in on a cotton-tipped applicator, after removing the mucus. A saturated solution of iodine crystals in pure phenol was used in making applications to the cervical canal in the more obstinate cases.

Involvement of Bartholin's glands was cured, when the ducts were patulous with pouting red orifices, by one or two applications of phenol solution.

In cases with a thickened and infiltrated urethra, with enlarged follicles along the course of the canal, the urethra is dilated by means of Hegar's dilators followed by light massage of the follicles over the dilator and the subsequent instillation into the urethra of a solution made up of iodine crystals, 5 grains, and albolene, 1 ounce. The solution should be retained in the canal from three to five minutes.

Of the 25 cases that comprised Hartz's series, 18 were cured in from four to ten weeks. Two of the remaining 7 cases were greatly improved, but still showed a few gonococci in the discharge from the cervix, the source of which was either from the husband, who also had gonorrhea, or from the Fallopian tubes discharging their contents, or from deep cervical glands beyond the reach of medication. Two patients were subsequently operated on for salpingo-oöphoritis, although the lower genital tract cleared up under treatment. The remaining 3 cases discontinued treatment.

Another use of iodine in the genital tract of women is that recommended by Welton.¹ In most conditions for which curetage of the uterus is advocated, Welton advises the use of iodine. He reports 208 cases satisfactorily treated after his method. He first gradually dilates the cervix and uterine canal. When this is accomplished, strips of gauze from 6 to 8 inches long were soaked in a 50 per cent. tincture of iodine. A strip of this gauze is then introduced into the uterus by means of a uterine sound. This is allowed to remain about a minute, is then removed and another strip of iodinized gauze introduced. As a rule, from five to eight strips are used. When a drain is required, the last strip is allowed to remain in the uterus. This is removed, as a rule, in about eight hours.

In postpartum and abortion cases in which material is in the uterus and a sapremic condition is present, even with temperature, the

¹ Long Island Medical Journal, March, 1914.

iodinized gauze is used as described above, with the exception that from two to five strips are introduced at once. The ends are then secured with a clamp and, by twisting, gradually removed. As a final step, one strip of the iodinized gauze is left in the uterus as a drain. In all these cases, the uterus was movable.

Welton prefers the 50 per cent. tincture to the official tincture, as it is readily absorbed into the tissues. It is an antiseptic, and if infectious microorganisms are present, either in the uterus or vaginal tract the iodine renders them harmless. It does not necrose the tissue. In cases of endometritis, it does the work which the curette was originally supposed to do. In atonic conditions and subinvolution, before the process is finished, the uterus contracts.

For years iodine in some form by mouth, by inhalation or by inunction, has been employed in the treatment of *tuberculosis*. Boudreau¹ prefers the tincture (the French tincture of iodine contains 1 part of iodine to 12 parts of a 90 per cent. alcohol). Beginning with 20 drops daily the drug may be increased to 100 or even 200 or 300 drops. Children of six or seven years can take from 40 to 60 drops daily. Signs of iodism are rare, and so slight as to be generally negligible. The tincture can be administered in milk or other beverages, except water, as in the latter it has a disagreeable taste. Boudreau's experience has been mainly with pulmonary tuberculosis, but he has also had encouraging results in *renal tuberculosis*.

As has been stated already, iodine has been used in the treatment of tuberculosis for many years, and some observers place great reliance on it. Personally, I have never seen any special benefit resulting from its use, except in the case of the *syrup of the iodide of iron*, which at times gives remarkably good results in the treatment of *tuberculous adenitis* in children.

Blum² has obtained beneficial results from the use of *hydriodic acid*, and the different iodide salts in the treatment of respiratory affections. The syrup of hydriodic acid is especially applicable for adults with sensitive digestion and for children.

Iron. It is a well-known fact that pills often become so hard that they are not dissolved after ingestion, and are passed through the gastro-intestinal tract unaltered. Pills containing iron seem to be especially liable to this. Schroeder³ states that 235 of a total of 324 official iron-arsenic pills (one hundred and thirty-eight of which were freshly made up) were found in the stools of 13 patients to whom they had been administered. Of 150 Blaud's pills taken by 13 patients, 128 were

¹ Journal de Médecine de Bordeaux, December 21, 1913.

² California State Journal of Medicine, May, 1914.

³ Hospitalstidende, December 24, 1913; abst. Jour. Amer. Med. Assoc., January 31, 1914.

recovered from the stools. Schroeder suggests the following formulas which he states prevent hardening:

I.

Arsenic trioxide	0.1 gm.
Dried ferrous sulphate	6.0 gm.
Flake manna,	
Extract of gentian	5.0 gm.
To be made into one hundred pills.	

II.

Arsenic trioxide	0.1 gm.
Dried ferrous sulphate	6.0 gm.
Pulverized licorice	4.0 gm.
Flake manna	5.0 gm.
Extract of gentian	q. s.

To be made into one hundred pills.

III.

Arsenic trioxide	0.1 gm.
Dried ferrous sulphate	6.0 gm.
Pulverized licorice	4.0 gm.
Glycerin of tragacanth	q. s.

To be made into one hundred pills.

None of these three pills harden with age, and not one of the 544 pills made according to these formulæ was ever recovered from the stools, although some had been made eleven weeks before use.

Several years ago there was considerable controversy over the relative merits of organic *versus* inorganic iron. Today they have essentially the same standing, and it is generally admitted that both forms can be absorbed and are equally efficient in the treatment of those conditions in which they are indicated. *Chalybeate waters* containing small amounts of ferrous sulphate or carbonate, have been employed for a long time in medicine, although their popularity has varied from time to time, depending on the changing views as to the usefulness of the inorganic salts. An experimental study of Bickell¹ has demonstrated that the iron from chalybeate waters is readily absorbed. Bickel administered the water to animals with fistulas of the small intestine which permitted the unabsorbed portions of fluids introduced into the alimentary tract to be collected again after traversing a portion of the upper intestine. The iron is absorbed into the circulation through the upper intestine while the excretion is accomplished through the lower bowel. The kidneys take little or no part in the excretion of iron. Iron containing water from the upper intestine was found to yield the element to the gastro-intestinal tract until the mucosa was saturated, then no more iron was taken up until a period of rest had occurred. It is thus apparent that iron may be gotten into the system by the ingestion of chalybeate

¹ Internat. Beiträge zur Pathologie u. Therapie d. Ernährungsstor, 1913, vol. v.

waters, although they do not seem to possess any advantage over iron as ordinarily administered.

Mercury. *Resistance to septic infection* can be increased, according to Krohl,¹ by the use of mercury. Having noticed that patients taking a course of mercury seemed to be especially resistant to ordinary infections, Krohl believed that the drug might have an action on the blood rendering it immune to septic processes. Experimentally, he found that rabbits injected with mercuric benzoate bore without harm the injection of serum from the blood of a woman who had died of puerperal fever, or injections of pure cultures of streptococci. A series of injections of 0.0015 gm. to 1 kilogram of the body weight rendered the animal non-susceptible to infection with streptococci.

The success obtained with rabbits led Krohl to apply the same treatment to patients threatened with septic processes. He cites an instance of a woman, threatened with puerperal sepsis, who recovered after three intramuscular injections of 0.01 gm. of mercuric benzoate, in the course of three days. In another case in which the treatment was instituted after symptoms of sepsis were well developed, the woman died. He cites these experiences as showing the importance of sterilizing the blood while it is still possible to do so.

Poisoning from tablets of mercuric chloride is probably the most common toxicological accident there is. This is largely due to the ease with which the drug is obtained. While in a few instances bichloride tablets are taken with suicidal intent, the great majority of cases of poisoning resulting from this cause are accidental. Wilbur² has contributed an article on the evil of allowing the sale of so-called "antiseptic tablets" without properly designating the nature of the material they contain. He calls attention to the fact that tablets containing mercuric chloride are being marketed under various names with no intimation that they contain a dangerous poison. Wilbur states that most States (thirty-eight) specifically include corrosive sublimate among the poisons, which it is unlawful to sell at retail. If the existing laws governing the sale of poisons were enforced, it would not be possible to obtain mercuric chloride containing tablets, except with a physician's prescription.

A remarkable case of poisoning from mercuric chloride is reported by Race.³ The patient, a woman aged thirty-eight years, took seventy-eight tablets of mercuric chloride, each containing 1.41 grains of that salt. Race saw the woman thirty-five minutes later and at that time she had no symptoms except a slight burning sensation in the throat and stomach.

Emesis was induced by the use of mustard and the mechanical irri-

¹ Berliner klin. Wochenschrift, October 20, 1913.

² Public Health Reports, November 14, 1913.

³ Cleveland Medical Journal, August, 1914.

tation of the pharynx. Egg albumen was given in divided doses until the washings returned clear, about 20 fluidounces being used before this was effected. Later, $3\frac{1}{2}$ ounces of a hot saturated solution of magnesium sulphate was administered. In less than two hours, free catharsis was established.

The patient recovered with no ill effects. The case is of interest in that it shows that the length of time which elapsed between the ingestion of the poison, namely, thirty-five minutes, is not necessarily a sufficient time to render a case hopeless.

Nitrites. In full doses the nitrites are essentially cardiac depressants, at the same time producing tumultuous action of the heart by relaxing inhibition. They cause vascular dilatation by paralyzing the vagus centres, and the centres for vascular tone. They also produce a throbbing pain in the head, beating carotids, a quickened pulse, flushed face, and vertigo. Other effects are the conversion of oxyhemoglobin into methemoglobin and, occasionally, sugar may be present in the urine.

Ebright¹ has investigated the effects produced on workers in a nitroglycerine factory. He states that, while occasionally a man will be found who is immune to the ill-effects of the drug, this is exceptional, and it is safe to say that all persons working in nitroglycerine powder works experience the disagreeable headaches which characterize nitroglycerine poisoning. The degree of exposure to nitroglycerine necessary to produce the headaches varies with the individual, the weather, and the state of immunity. A new worker is very susceptible, and warm weather greatly increases the frequency and severity of the symptoms. As a rule, three or four days' exposure is sufficient to establish immunity, which persists so long as the man remains at work, or unless he is exposed to unusually large doses. The immunity is also rapidly lost, and even a couple of days absence from the works will again render the worker susceptible to the headaches. To prevent this, the workmen are in the habit of placing some of the product on their hat bands during their absence from the factory, in order to maintain their immunity.

The symptoms are described by Ebright, as follows: A throbbing headache is characteristic. It frequently begins in the forehead and moves to the occipital region, where it remains for from an hour or two to three or four days. It may be associated with a sense of exhilaration at first, but most of the workers are depressed. Restlessness and inability to lie quietly in bed are often present. Many cannot sleep, so that the unfortunate victim is doomed to make the best of his pain propped up in bed, through a couple of sleepless, restless nights, often with nausea or vomiting, and, in severe instances, with diarrhea. Maniacal attacks were not noted among the men whom Ebright examined.

¹ Journal American Medical Association, January 17, 1914.

He quotes Laws,¹ however, who has seen individuals become so wild and incoherent as to require restraint.

As to permanent effects, Ebright states that the general health of the men working in nitroglycerine appeared to be impaired in no way. This he ascribed largely to the fact that the men were selected because of their reliability and sobriety, and on account of the hazard of their occupation. Their blood-pressure ranged within normal limits and there was no evidence of chronic low blood-pressure. As far as the complexion of men was concerned, there was no evidence of destructive blood change, such as might have been anticipated by constant destruction of oxyhemoglobin.

In an experimental study on the *action of the nitrites and drugs of the digitalis group on the isolated coronary artery*, Voegtlín and Macht² found that all the nitrites were found to produce relaxation, while the digitalis-like bodies produce the opposite effect. Whenever, therefore, coronary spasm is to be avoided or guarded against, it would be advisable to employ digitonin-containing preparations, or simultaneously administer the nitrites. Furthermore, if angina pectoris is due, as is generally assumed, to spasm of the coronary vessels, their results would certainly tend to explain the favorable action of the nitrites in coronary angina.

In another experimental study, Macht³ investigated the *action of the nitrites on the isolated surviving pulmonary artery*. He found that sodium nitrite, nitroglycerine, erythral tetranitrate and amyl nitrite all produced a contraction or constriction of the pulmonary arterial strip. This remarkable action of the nitrites, which have always been known as typical vasodilators, though unexpected, probably holds good in the living body also, having been corroborated by other observers. Thus H. C. Wood, Jr., by the blood-pressure method, noted a rise of pulmonary pressure after amyl nitrite, which he believed to be due to a pulmonary vasoconstriction.

In view of these observations, it will be seen that in causing a constriction of the pulmonary vessels, and at the same time being efficient peripheral and splanchnic vasodilators, the nitrites should meet the ideal requirements for the control of pulmonary hemorrhage. As is well known, they have been so employed since 1898 when Flick published his results following the use of nitroglycerine. While there is no doubt that the use of the nitrites for the control of pulmonary hemorrhage is the most generally employed method today, it is to be borne in mind that they fail entirely too often. As I have already pointed out (under the heading *Emetine*) the only certain method of stopping pulmonary

¹ Journal American Medical Association, March 5, 1910.

² Journal of Pharmacology and Experimental Therapeutics, September, 1913.

³ Journal of the American Medical Association, February 14, 1914.

bleeding is by compression through the induction of an *artificial pneumothorax*.

Not so many years ago symptoms of *high tension* were almost universally treated with the nitrites. The reduction of the tension to what was assumed to be the normal was the *sine qua non* in treatment. The enormous amount of work, both clinical and experimental, which has been done within the past decade has brought about more rational methods of treatment. It was quickly learned by all who studied the subject that hypertension, provided it was not excessively high, was not to be regarded, necessarily, as inimical to the patient's welfare. On the other hand, so far from trying to reduce the tension, our object, in many instances, is to maintain it at its high level. There are still too many who fail to realize that high blood-pressure is not a disease but an evidence of disease. It is not pathologic, but is usually, if not always, physiologic in meaning. And, as Brooks¹ insists, it tends more to prolong life than to shorten it. Where its causes cannot be removed, it is not to be treated but maintained.

Hare² asserts that in the pressure of *arteriosclerosis* a high blood-pressure may be said to be, in the majority of instances, as necessary for the maintenance of an approximately normal existence as cardiac hypertrophy is essential if life is to be maintained in the presence of chronic valvular disease. To express it differently, a high-pressure is essential in order that the blood may pass with reasonable freedom and quantity to the tissues that require it, even though the blood paths are tortuous, unyielding, and narrow.

While it is true that a diastolic pressure of 80 or 90, and a systolic pressure of 120 to 130, may be said to represent the normal bounds for perfectly healthy adults, it is not to be forgotten that in the presence of disease these so-called normal standards are to be ignored to some extent. As Hare states, we frequently see cases in which the physician has endeavored to reduce an abnormally high blood-pressure to one which is approximately and theoretically normal, with the result that the patient first suffers from lack of initiative, then from actual feebleness and dyspnea on exertion, and finally develops a state in which he is far more wretched than before therapeutic measures were instituted.

Mantle,³ in discussing the undesirability of active therapeutic means to reduce hypertension, puts the question, How are we to determine the true position of a case of supernormal pressure? As he states, these cases always cause anxiety, as we are confronted with two dangers; and with one eye we see visions of a possible catastrophe through the rupture of a weak vessel by doing too little, and with the other the danger of doing too much in lowering the pressure and weakening the circula-

¹ New York Medical Journal, July 25, 1914.

² Therapeutic Gazette, October, 1913.

³ Proceedings of the Royal Society of Medicine, May, 1913.

tory force. He believes that an approximately correct position can be taken by obtaining a careful history of the case, observing the condition of the cardiovascular, renal and alimentary systems, and, in addition, try to find out the cause of the high pressure, such as error in diet, alcohol, syphilis, lead, and excessive mental worry. If the left ventricle is hypertrophied, it suggests that the pressure has been persistently high for some months or years. Finally, it is to be borne in mind that high pressure is not a disease *per se*, but a symptom only.

As an illustration of how an already high pressure can be raised profitably, Mantle¹ cites the following case:

A man, aged sixty-five years, had a blood-pressure of 180 mm. of mercury, an enlarged heart, and dyspnea on exertion. There was no albuminuria and the vessels were not palpably thickened. In this case Mantle realized that the difficulty was too low a pressure rather than too high a one. Accordingly, the patient was given strophanthus and nux vomica to raise his pressure and Nauheim baths and Schatt exercises to open up his peripheral circulation, with the result that after three weeks' treatment the pressure rose to 195, the heart became more regular and his disagreeable symptoms abated. Later, when his pressure reached 200, he became very comfortable.

In view of the opinions expressed above, What place have the nitrites in the management of cases of hypertension? At one time the drugs *par excellence* in the treatment of high blood-pressure, they now occupy a relatively unimportant place. At best, they are emergency drugs used to combat sudden and dangerous symptoms in cases of excessively high tension. Once this emergency has passed, most observers find no place for them.

The principal reason for this is the transitory action of the nitrites. As has been shown already by Ebright,² individuals can be immunized to the drug very quickly. At best, the effects they produce are fugacious and not to be relied on beyond a very limited period. The only form in which the nitrites exert anything like a lasting effect, is in the form of sodium nitrite or erythrol tetranitrate. And even with these the vasodilating effects are quickly exhausted.

As I have pointed out already, the chief use of the nitrites in treating cases of hypertension is to combat alarming symptoms. This is concurred in by Edgecombe,³ Hall,⁴ Mantle,⁵ and Piersol.⁶ The latter states that in a series of 50 cases in which the average systolic pressure was 200 mm., nitroglycerine was employed at some time in the treatment of 28 cases. Of this number it seemed to have a beneficial effect on the blood-pressure in but 3; in 6, its advantage or disadvantage

¹ *Lancet*, May 3, 1913.

² *Loc. cit.*

³ *Proceedings of the Royal Society of Medicine*, May, 1913.

⁴ *Clinical Journal*, May 20, 1913.

⁵ *Loc. cit.*

⁶ *Therapeutic Gazette*, September, 1913.

could not be determined; while in the remaining 19 cases it had apparently no noteworthy effect.

The management of hypertension, therefore, becomes a question of relieving, as far as possible, the exciting cause, and not of attacking the most obvious symptom. In other words, the treatment is general and not symptomatic.

Piersol¹ divides the treatment of high blood-pressure into prophylaxis and the management of the condition once it has developed. In order to prevent hypertension, the first step is the early recognition of the conditions which produce it. The most important thing, in Piersol's opinion, is the routine examination of the blood-pressure in all individuals who present themselves for treatment. In addition, it is important to know all about the patient's general hygiene and mode of life; his dietetic habits; whether the eliminative organs are functioning properly and whether there is any chronic infection, as sinusitis, pyorrhoea alveolaris, chronic prostatitis, pelvic inflammatory disease, etc. Finally, it is important in arteriosclerosis to educate patients to realize the necessity of easing up upon the activities of life after fifty is reached; of lessening the quantity of food taken as they grow older; to avoid alcohol and tobacco or, at least, be very sparing in their use, and lastly, as a precautionary measure, to submit themselves for physical examinations and blood-pressure determinations at stated intervals.

In the treatment of well-developed hypertension, Piersol considers rest, diet, elimination and drugs.

Rest in bed is one of the most efficient methods we have for aiding in the readjustment of a disturbed circulation. This may be absolute at the beginning of treatment. Later it can be reduced, but under any circumstances the patient should have at least eight hours rest in bed every night. Sudden strain must be avoided, as should anything which tends to produce either bodily or mental fatigue.

The dietetic management of these cases is comparatively simple. Overeating is probably the worse dietetic offence.

Nitrogenous articles of food should be restricted and all stimulants, especially alcohol, coffee, and tobacco avoided. Meals should be regular, and the food well masticated. The heavy meal of the day should be at midday. Fluids should be limited to 6 ounces at meals. Water should be taken between meals. A rest of one-half hour after meals is desirable.

The chief avenues of elimination, besides the kidneys, are the bowels and the skin. Violent cathartics and excessive sweating, are to be avoided. The steam-room of the Turkish bath is both depressing and dangerous. Piersol recommends the following measures for promoting elimination through the skin; short electric baths, hot packs or even a simple hot bath. In some cases, venesection gives excellent results.

¹ Loc. cit.

In regard to drugs, the role of the nitrites in high tension cases has already been considered. Mention has been made also of the indications for digitalis. For the relief of some of the most distressing symptoms, such as headaches, throbbing and vertigo, cardiac depressants are at times effective. Among these, Piersol mentions *aconitine* (gr. $\frac{1}{200}$ every four hours), tincture of *aconite* (15 to 25 drops four times daily), and the fluid extract of *veratrum viride* (3 minims every four hours). The iodides are commonly used and are probably always indicated if a history of syphilis is present.

Piersol sums up the treatment of high blood-pressure as follows:

"All things considered, it must be admitted that in well-developed hypertension dependent upon organic changes, be it of vascular or renal origin, efforts to lower it are of but little avail. In the 50 cases I have analyzed, in only 14 can it be said that any of the therapeutic measures employed had much effect on lowering the blood-pressure. On the other hand, there is little doubt but that the general hygienic treatment of these patients, relieving them from physical exertion and mental anxiety, regulating their digestions and promoting their elimination, were most important factors in adding to their comfort and prolonging their lives, even though the hypertension itself was unaffected."

Nitro-muriatic Acid. In the treatment of *boils* and *skin infections*, Allen¹ recommends freshly prepared dilute nitro-muriatic acid in doses of from 10 to 15 drops in water, after meals. Under its use he has seen lesions starting in a hair follicle disappear in a few days.

Allen is opposed to opening boils and superficial skin infections. He believes they do better if let alone, unless they come to a head. Otherwise opening them does nothing in shortening their course or lessening the pain.

Petrolatum. At the present time *liquid petrolatum* or *Russian mineral oil* is being used extensively in the treatment of *intestinal stasis* and *chronic constipation*. Its use under these circumstances has been brought about largely through the recommendation of Sir Arbuthnot Lane. In a review of the subject, the Council of Pharmacy and Chemistry of the American Medical Association² points out that the use of liquid petrolatum and of petroleum products generally is by no means novel, although until Lane brought them forward they had not made a place for themselves in the treatment of intestinal affections.

Since they have gained popularity they have been marketed under a variety of names, proprietary and otherwise. The Council of Pharmacy and Chemistry gives a list of nearly fifty different names by which the product is known. For pharmaceutical purposes, liquid petrolatum may be divided into two grades, the lighter or more limpid oil, used as a vehicle for oil sprays and the heavier, more viscid oil used

¹ New Orleans Medical and Surgical Journal, June, 1914.

² Journal American Medical Association, February 14, 1914.

as an ingredient of ointments, and more recently as a remedy in the treatment of intestinal stasis. It would appear important to note the physical characteristics of the oil and to insist on absence of color, odor and taste, and also absence of acid or alkali. It is also important that the specific gravity is in harmony with the purposes for which the oil is used. The lighter oils have a specific gravity ranging from 0.860 to 0.870. At the present time there is some difference of opinion as to the exact nature of the product that is preferable for use for different purposes.

The liquid petrolatum recommended by Lane in the treatment of intestinal stasis, is officially recognized in the British Pharmacopoeia as having a specific gravity of 0.885 to 0.890 at 15° C. Lane cautions against the use of the lighter oil as extensively prescribed in this country as a vehicle for sprays in nose and throat work.

Paraffin oil is not absorbed from the intestinal tract, nor is it dissolved, and, so far as is at present known, produces no untoward effects. The present opinion is that the oil is almost entirely mechanical in its action, and that it simply acts as a lubricant. It is also said to have a soothing action on spasmotic contraction and to retard intestinal absorption. As one of its uses is the treatment of skin lesions, it has been suggested that it might also have a healing action on intestinal lesions.

The Council of Pharmacy and Chemistry recommends that manufacturers and pharmacists dispense the oil in accordance with the following directions: *Petrolatum liquidum, Grave—heavy (Russian) liquid petrolatum—paraffinum liquidum, B. P.—liquid paraffin.* A heavy, transparent, colorless, tasteless, non-fluorescent, oily liquid, odorless when cold, but giving off a faint petroleum odor on heating. This preparation should correspond to the requirements of the British Pharmacopœia for liquid paraffin and have a specific gravity of about 0.885 to 0.890 at 15° C. It is insoluble in water or alcohol, but soluble in boiling absolute alcohol and readily soluble in ether, chloroform, carbon disulphide, petroleum benzin, benzine, and fixed and volatile oils. It serves as a solvent for volatile oils and related substances, such as camphor, menthol, and thymol.

Oil of this type is the form recommended by Lane for internal administration. It is also used as a basis for ointments and salves and as a local application to wounds, ulcers and certain skin diseases in which a protective is desired.

Petrolatum Liquidum, Lere—light (Russian) Petrolatum. A transparent, tasteless, non-fluorescent, oily liquid, odorless when cold, but also giving off a faint petroleum odor on heating. In other respects this preparation should correspond to the pharmacopœia tests for liquid petrolatum and have a specific gravity of about 0.860 to 0.875 at 15° C. It is soluble under the same conditions as the heavy oil and also acts as a solvent for substances such as camphor, menthol, and thymol.

The light oil is the form extensively used as a vehicle for the oily sprays in nose and throat work. It is also used internally in the treatment of chronic stasis of the intestine; and although much more readily taken than the heavier oil recommended by Lane, care must be taken in securing a specimen free from the lighter fractions of petroleum distillates.

Paraffin oil is usually given in doses of from one to two and a half teaspoonsful half an hour or an hour before meals, or in large doses (four to six teaspoonsful), at one time on retiring.

So far as known, comparatively huge doses may be administered without producing untoward results.

As it is not soluble in water or the ordinary solvents, it cannot be diluted and must be taken, therefore, raw. Some preparations have added to them some aromatic substance, such as cinnamon. Although tasteless, the oil does leave a disagreeable, slimy taste in the mouth, unless immediately removed. This can be done by following the oil with a swallow of warm water or milk; the latter I have found very satisfactory.

According to many observers, liquid paraffin should not be given with or after meals, because it may exert an inhibiting influence on the digestion of food. In a limited experience, I have found that, taken after meals, it often acts most efficiently in preventing the annoying distention that sometimes occurs after eating. This is probably due to the fact that it limits the excessive production of hydrochloric acid.

Manquat¹ recommends the use of liquid petrolatum in constipation in all its forms, and especially when accompanied by irritation or spasm of the intestine; in hemorrhoids, prostatic enlargement, mucous-membranous enteritis, liver disease, backward displacement of the uterus, chronic appendicitis, after abdominal operations, and in hyperchlorhydria.

While paraffin oil is at present on trial and additional experience may limit its use, I think there is every reason to believe that in it we have an excellent addition to our resources for dealing with constipation.

Pituitrin. The universal acceptance of pituitrin as the most reliable *ecbolic* which the obstetrician has at his command is one of the proofs we have that the medical profession, as a class, is quick to seize upon that which has true merit. Except in the way of caution against its use under certain circumstances, I have not encountered a single adverse criticism during the past year against pituitrin. Reports as to its remarkable properties have been made from all over the world, and the literature during the year has grown to such proportions that it is not possible to review more than a fraction of the papers. While not reflected in the literature, except as a warning, there is reason to believe that pituitrin is being used by many practitioners as a routine measure in all cases of labor, and without due consideration of well recognized

¹ Bulletin de l'Academie de Médecine, January 27, 1914.

contra-indications. This is to be deplored, as it may bring in disrepute one of the most efficient remedial agents introduced within recent years.

The concensus of opinion, among those who have written on the subject, seems to be that pituitrin is a remedy *par excellence* for the promotion of labor pains in the second stage of labor, after the os is fully dilated. The use of the drug in the first stage of labor is condemned by many of the leading authorities, among whom may be mentioned Edgar,¹ as a dangerous practice. The accidents apt to occur under these circumstances are death or deep asphyxia of the fetus, separation of the placenta, uncalled-for laceration of the cervix, and possible uterine rupture. The reasons for this are obvious. The os in the first stage being incompletely dilated, the uterus is powerfully stimulated by the pituitrin with the result that the child is severely compressed, and, if forced through the partially dilated cervix, is apt to lacerate the latter badly or even rupture the uterus itself. Edgar reports 39 cases of inertia in the first and second stages in which two and probably four stillborn children resulted from the use of pituitrin before full dilatation had occurred, and, in addition, three instances of deep laceration of the cervix requiring suture to control the bleeding. It was this report of Edgar's among others, made when pituitrin was first introduced, that called attention to the conditions under which it was inadvisable to employ the drug.

Hofstätter,² in a review of the literature on the subject, states that, except in isolated instances of overdosage, no important disturbances can be attributed to the remedy, most of the unpleasant phenomena reported can be referred to nervous or blood-pressure symptoms. Many of them are purely accidental or misinterpreted results of a preexisting condition. He states that with the dose permissible to the human subject no case of injury to the kidneys has as yet been reported. It might be mentioned here, however, that von der Velden,³ from an experimental and clinical study, found that extracts of the pituitary body depress kidney functioning.

In reference to possible accidents to the uterus, Hofstätter states that while up to the present, no rupture of the uterus has been reported, still, with a wider and perhaps less judicious use of the extract, this is not unlikely to occur, and it is well to consider any ecbolic action contra-indicated in cases which present signs of dilatation of the lower segment of the uterus.

The *contra-indications* to the use of pituitrin were given last year, but their importance justifies repetition. They are of two kinds: (1) Those referable to the uterus and its contents; and (2) constitu-

¹ American Journal Obstetrics, July, 1913.

² Monatsschrift f. Geburts. und Gynäk., 1913, vol. xxxviii.

³ Berliner klin. Wochenschrift, November 10, 1913.

tional disorders in the mother. Of the first, Hendley¹ mentions the following: Face presentations, frontal presentations, transverse positions, breech presentation, pelvic contraction, malformation of the child, as hydrocephalus and the presence of uterine tumors, such as fibroids. And even of greater importance is the condition of the cervix and the stage of labor. As most writers emphasize, it is to be used in the second stage when the os is dilated. The reasons for this have already been mentioned. Welz² warns that pituitrin should never be administered until the accoucheur is thoroughly familiar with his case and certain that no harm will result. This sounds trite and unnecessary, but there is reason to believe that in some instances, at least, the drug is given routinely and without due regard for the circumstances under which it may produce harm.

Rich³ warns against the use of the drug simply as a means to hurry things for the convenience of the doctor, when the labor is progressing normally. He is satisfied that much harm will result from this misuse of the drug. All must admit that a reasonably slow labor is safer and better, for both the mother and child, than a short, violent one. Selley⁴ is another who insists that pituitrin has no place in normal labor, and should be given only in the presence of recognized indications.

As to contra-indications referable to the mother, it is the present belief that pituitrin should be withheld in the presence of myocarditis, arteriosclerosis, and marked nephritis.

It is a well recognized fact in obstetric work that the danger of infection has a distinct relationship to the amount of interference practiced. Repeated examinations are not desirable, and, when made, the hand should always be covered with a rubber glove; and the introduction of anything within the birth canal increases the possibilities of infection. It has been pointed out by several writers in recent articles that pituitrin has greatly reduced the indications for the use of forceps. This is to be desired as it will greatly lessen the number of lacerations and contusions, hemorrhages, and paralyses among the children. Anderson⁵ is one of those who believe that the use of pituitrin will lessen the necessity for forceps. And even in those cases in which the forceps is necessary, Anderson believes that pituitrin renders the application of forceps less difficult and far less dangerous by bringing the head within easy reach. He states that there are numerous striking examples in the literature where inertia of the uterus threatened death of the fetus, and wherein forceps application would have been most difficult, because of lack of engagement. Pituitrin caused the head to engage in each instance, and brought it within reach of the forceps.

¹ British Medical Journal, May 16, 1914.

² Journal of the Michigan State Medical Society, September, 1913.

³ Northwest Medicine, June, 1914.

⁴ Journal of the Michigan State Medical Society, July, 1914.

⁵ Buffalo Medical Journal, May, 1914.

Davis,¹ in discussing the relative merits of the forceps as compared to pituitrin, gives the following reasons for his advocating the use of the pituitary extract: That it will obviate all shock to the mother, and possible injury to the child's head; lessen the possibility of infection; lessen the liability of lacerations (occurring in nearly all instrumental cases), and leaving non-elastic tissue in scar substance, with the strong probability of repetition of the laceration in all subsequent labors, and, lastly, the woman is saved many hours and sometimes days of suffering. Seeley² is also of the belief that the use of forceps can be reduced in frequency and, when necessary, rendered easier by the use of pituitrin.

In addition to the ecbolic properties of pituitrin, it also has a most favorable action on the urinary function in the period immediate following delivery. In nearly all of the reports in which the writers give their clinical experience, mention is made of the fact that the amount of urine passed is satisfactory, and that postpartum retention of urine rarely occurs, thus obviating the use of the catheter.

Briefly summarized, the ecbolic properties of pituitrin, and the proper indications for the drug may be stated as follows: Pituitrin, while in a sense an artificial aid, produces contractions of the uterus which are practically identical with those occurring under natural conditions. The drug should never be employed except in the second stage of labor, when the os is fully dilated, and even then only in the presence of uterine inertia. It cannot be too strongly stated that its employment as a means to hurry things along should never be countenanced. Furthermore, the drug should be withheld until it is known, so far as is possible, that none of the recognized contra-indications to its use are present.

The use of pituitrin in the management of *incomplete abortion*, or in the production of therapeutic abortion, while advocated by a few, is not considered advisable by the majority.

Herron,³ who has reported on the use of pituitrin in 105 cases of labor, states that during this period he also treated 17 cases of abortion. He did not use pituitrin as he had excellent results from promptly emptying the uterus. Watson⁴ states that in the induction of abortion, in the treatment of abortion already in progress, and in incomplete abortion, the action of pituitrin is so uncertain that it is not to be recommended except in cases in which the os is widely dilated.

Lindeman⁵ gives the following directions as to dosage. He states that the drug should always be administered by intramuscular injection and preferably in the middle third of the deltoid. It cannot be too strongly urged that the initial dose be not over 0.1 gm. (1 c.c. of the

¹ West Virginia Medical Journal, June, 1914.

² Journal of the Michigan State Medical Society, July, 1914.

³ St. Paul Medical Journal, April, 1914.

⁴ Canadian Medical Association Journal, September, 1913.

⁵ American Journal of Obstetrics, February, 1914.

Parke, Davis & Co. or 0.5 c.c. of the Armour or Burroughs-Wellcome preparation) in all cases in which the patient is already in labor. In those cases in which it is used early in labor with the cervix dilated to less than four fingers, and the membranes ruptured or unruptured, Lindeman would use only half this amount; where the cervix is dilated over four fingers, and the membranes intact, he would use the full dose; but if the membranes are ruptured, again he would use only one-half the dose. The rule of four fingers, while arbitrary, has proven rather satisfactory in Lindeman's experience for this reason: Where the cervix is less than four fingers dilated, the pressure with each pain comes almost directly from above, and the dilatation occurs chiefly by retraction, as there is very little protrusion of the rounded wedge into the cervical orifice. But after the cervix is four fingers dilated, the wedge, consisting of the bag of waters or the head, is pretty well engaged in the orifice, and the dilatation occurs by actual dilatation or divulsion. Now in this case if the hard head does the stretching too forcibly, severe tears are likely to result, and Lindeman consequently advises smaller doses than where we have the soft bag of waters acting as the dilator.

After the cervix is completely dilated, full doses can be safely given, unless there is marked disproportion, obstruction or weakening of the uterine muscle. These conditions with too violent a labor might cause a rupture of the uterus, but, if no obstruction is present, there is nothing to fear.

Albrecht¹ has found pituitrin of service in the treatment of amenorrhea, menorrhagia, and allied conditions.

In addition to its use in obstetric practice, pituitrin has also, within the past year or so, been employed in other conditions. Of the secondary uses to which pituitrin has been put the most important seems to be in the relief of *intestinal stasis* following operations. In no condition, aside from its use in obstetrics, does it apparently work more satisfactorily than when it is desired to stimulate intestinal activity for the expulsion of gas after abdominal operations, when the development of tympanities is not only a painful and distressing condition, but often a dangerous complication. The only drug heretofore employed for this purpose has been eserine, but, in the majority of instances, it fails completely. Harvey² cites a number of cases in which the use of pituitrin has been of the greatest service. In cases of appendectomy, Harvey states that the early use of pituitary extract will almost without fail render the first days after operation comfortable. He believes that it is also useful in cases of fecal accumulation and intestinal stasis. The drug is administered hypodermically. Morphine can be given in conjunction with the pituitrin. Harvey states that the tendency of

¹ Albany Medical Annals, December, 1913.

² Medical Record, March 21, 1914.

morphine to aggravate the condition of stasis seems to be eliminated when used in association with pituitrin. Porritt¹ also reports good results from the use of pituitrin in the treatment of intestinal stasis.

Citilli² reports good results from the use of pituitrin in the control of hemorrhages which may occur during or after operations on the nose and throat. He is in the habit of injecting 1 c.c. as a preventive in cases in which he performs submucous resection of the nasal septum under anesthetization by means of local applications of adrenalin and cocaine. Under such circumstances the amount of hemorrhage is reduced, and later it occurs in the form of limited oozing. Citelli has also obtained good results in hemoptysis and in the bleeding due to a hemorrhagic diathesis.

Rohmer³ has been using a combination of pituitrin and adrenalin in acute circulatory disturbances associated with such conditions as typhoid fever, croupous pneumonia and diphtheria. The great objection to adrenalin has been the fact that it only increased the blood-pressure temporarily and that this was followed by a fall, sometimes menacing, below the original figure. The action of pituitrin being more prolonged makes the combination of the two substances a satisfactory one. Behrenroth⁴ states that the effect of pituitary extract on the human blood-pressure is by no means uniform, and does not correspond to the striking results obtained in animal experimentations. It will be recalled, however, that in last year's review, J. H. Musser, Jr., reported, as the result of a clinical study, that the prolonged administration of the extracts of the pituitary gland does exert a distinct pressor effect upon the peripheral vascular apparatus, which persists for an appreciable time after discontinuing the drug.

Recognizing the good results obtained in asthma from the use of adrenalin, Crookshank⁵ was led to try the effect of pituitary extract in this disease. During the past six months he has treated 20 patients with pituitary extract in the form of 2-grain tablets of the gland substance, given night and morning. He states that, without exception, each one of the patients so treated has expressed himself as greatly benefited; the attacks have been far fewer and less severe, while the general health has, in most cases, greatly improved. There is no doubt in his mind but that the continued administration of pituitary gland substance is of marked benefit in many cases of asthma, is without apparent drawback, and renders the occurrence of severe paroxysms, requiring adrenalin, quite infrequent. The cases treated by him have been inveterate habitues of the out-patient department, who have suf-

¹ British Medical Journal, May 23, 1914.

² Zeitschrift f. Laryngologie, Rhinologie und ihre Grenzgebiete, 1913, p. 525.

³ Münchener med. Wochenschrift, June 16, 1914.

⁴ Deutsches Archiv. f. klinische Medizin, 1914, vol. cxiii.

⁵ Lancet, March 14, 1914.

ferred for years, and have not hitherto been often without paroxysms or distress for more than a day or so at a time.

The only drawback which at present exists in regard to pituitary extracts is the variation in the different samples. Roth,¹ in an examination of the commercial preparations now on the market, states that at present a wide variability exists in the activity of the samples examined.

Hofstätter,² in a review of the literature, came to the conclusion that the explanation of individual results in the administration of the extracts is still hypothetical. In some instances failure has been reported, and, in others, striking secondary effects have been noted. This is probably due to the variability of the preparations mentioned by Roth. It is almost certain that in a short time the different preparations will be fairly accurately standardized.

Quinine. Hudleston³ asserts that every one who has had experience with the *prophylaxis* of *malaria* by the administration of quinine will agree that so far it has lamentably failed, and he believes that further investigations should be carried out to determine why it has failed. He quotes a number of instances to prove this assertion. Thus, Lelean, in reporting upon the use of quinine as a malaria prophylactic in Indian jails, gives the following statistics, 130 being in each group: Group A got no quinine, and the admission rate from the malarial district per 1000 was 476. Group B received 5 grains daily, and its admission rate per 1000 was 476. Group C received 15 grains twice weekly, and its admission rate per 1000 was 476.

Hehir and Adie (quoted by Hudleston), of the Indian Medical Service, reported that of the children attached to the troops, no less than 43 per cent. of those examined had malarial parasites in their blood, although all those children were getting the equivalent of 10 grains of quinine twice or thrice weekly, and, of 150 of the men of the garrison doing duty and not on the sick list, more than one-quarter were carrying malarial parasites in spite of the large amount of prophylactic quinine which they were given. The opinion is expressed that the doses were so large that if increased they would interfere with the ordinary round of duty. That the failure of quinine in these cases to act as a prophylactic was not due to any fault of the drug was proved by an analysis which indicated that it was of excellent quality.

These failures of the drug to protect may be explained on the basis that the use of small doses of quinine over a long period of time results in the development of a quinine-resisting strain of malarial parasite. This has been shown by Ehrlich and others to be the case with various forms of protozoa.

¹ Journal American Medical Association, August 8, 1914.

² Loc. cit.

³ Journal of the Royal Army Medical Corps, September, 1913.

Hudleston advances, as the proper explanation, the fact that quinine may diminish the opsonic power of the blood. Furthermore, he is firmly of the belief that comparatively small doses of quinine given over long periods produce a quinine resistance on the part of the parasite.

From the above it would seem that the prophylactic value of quinine is not as certain as some have believed, and it should also be borne in mind that in some instances in which prophylactic doses of quinine have materially diminished the occurrence of the malady, other preventive measures have been chiefly responsible, such, for example, as the care of those who are infected, the use of mosquito bars and the proper drainage of malaria-breeding pools.

Whether *hemoglobinuric fever* is produced by malaria alone, or as the result of the administration of quinine to a malarial patient, is not definitely settled. Some years ago there was considerable debate on the subject without there being any very conclusive evidence produced for either side. Lovelace,¹ from an experience with 514 cases, states that malarial infection stands in a direct causal relation to blackwater fever, but is not due to a particular species of malarial parasite. In his experience, quinine, in large or small doses, was an invariable antecedent of the hemoglobinuric condition. Under no circumstances should quinine be given to a blackwater fever patient during the period of hemoglobinuria, nor for several days thereafter. Lovelace believes that the effect of the paroxysm of hemoglobinuria is itself that of drastic but temporary therapeutic agent, decimating the parasites in the patient's blood, much as a single intravenous injection of salvarsan decimates the spirochetæ of syphilis in the lesions of that disease. Quinine will be necessary later, but it should not be given until several days after the urine has become free from hemoglobin, and even then should be used cautiously. In Lovelace's opinion, the prophylaxis of malaria is the prophylaxis of blackwater fever.

In the *treatment of amebic dysentery*, Brooks² considers *emetine* as being specific in its action in the early stages of the disease, but in the chronic forms of the disease he advises *quinine*. He states that in the acute cases of entamebic dysentery, ipecac or preferably its alkaloid, emetine, given hypodermically, apparently has a specific action on the disease, and that it is also a valuable remedy in the chronic form of the disease, but does not act with the same promptness and certainty in the chronic condition, as it does in the acute. In his experience, quinine sulphate by mouth in doses of 30 grains per day appeared to be as efficient as ipecac, and had the further advantage of always being available and much cheaper than emetine. In most cases the quinine can be given with less discomfort to the patient than ipecac or its active principle.

¹ Archives of Internal Medicine, June, 1913.

² Journal American Medical Association, March 25, 1914.

Considerable interest has been aroused during the past year on the use of *quinine* in the treatment of *rabies*. Moon¹ reports that quinine sulphate by way of the stomach cured the active disease in inoculated dogs, and Harris² has reported one case in a human being in which recovery seemed to follow the injection of quinine and urea. While positive proof that Harris' case was undoubtedly rabies in wanting, he feels that the diagnosis was correct. He also feels that the quinine contributed toward the favorable outcome of the case. The drug was administered as follows: At 5 P.M., 15 grains of quinine and urea hydrochloride dissolved in 3 c.c. of salt solution were given intravenously. This dose was repeated at 7, 9 and 11.30 P.M., and on the next day at 9.45 A.M. and 11.30 P.M., making a total of 90 grains within twenty-four hours. The following morning the pain over the area of the bite had disappeared, and he drank without difficulty. Later the man developed delirium tremens, a fact that throws some doubt on the case.

Two experimental studies, one by Cumming³ and the other by Halliday,⁴ in which rabbits and guinea-pigs were inoculated intracranially with rabies, gave negative results from the use of quinine. Cumming used the bisulphate of quinine intraperitoneally, and Halliday the bisulphate of quinine and quinine and urea. Inasmuch as the quinine failed as a preventive measure against extremely small doses of virus in actual tests, Cumming questions whether the treatment can be of curative value in cases of hydrophobia manifesting symptoms in which the amount of virus would be many thousand times greater. His observations led him to conclude that we cannot expect favorable results from quinine after symptoms of hydrophobia have developed.

Cables⁵ reports 8 cases of *sciatica* successfully treated with hypodermic injections of quinine and urea hydrochloride. He employed a 4 per cent. solution in normal salt, and made the injection subcutaneously over the course of the nerves. No attempt was made to inject the nerve itself. The author does not mention the amount of the drug used at each injection.

Underhill⁶ reports the case of a young woman who took 100 2-grain quinine pills with suicidal intent. Recovery took place, but with a marked *quinine amblyopia* which, however, eventually cleared up.

Salicylate of Sodium. The intravenous administration of sodium salicylate has been given a trial by Conner⁷ in 12 cases of *acute articular rheumatism* of various degrees of severity. Chemically pure, crystalline sodium salicylate was used alone in a 20 per cent. solution. At

¹ Journal of Infectious Diseases, 1913, xiii, p. 165.

² Journal American Medical Association, October 25, 1913.

³ Journal of Infectious Diseases, July, 1914.

⁴ Journal of Medical Research, July, 1914.

⁵ Journal American Medical Association, December 27, 1913.

⁶ Ibid., May 2, 1914.

⁷ Medical Record, February 21, 1914.

first Connor employed a needle of the size commonly used in obtaining blood cultures. As this was followed occasionally by thrombosis at the site of the puncture, he began using a small hypodermic needle. He then had no further difficulty and was able to use the same vein over and over again without the slightest pain, and without local irritation or thrombosis.

In most of the cases the dose was 15 or 20 grains given at twelve or eight hour intervals over a period of from three to six days. In robust subjects, as much as 30 grains were occasionally given at one time, and as much as 120 grains in the first twenty-four hours without any unpleasant effects. Connor states that one of the noticeable features of this method of administering the salicylate was the entire absence of shock, prostration, or other objectionable constitutional effect. The relief of pain was prompter and more pronounced than is usual when the drug is given by mouth.

While his results were excellent, Connor does not advocate the intravenous method as the one of choice, and does not think it should be employed in place of administration of the drug by mouth for routine cases. He is convinced, however, that it has a distinct place in the management of acute rheumatism, and that it solves satisfactorily the problem of the treatment of those patients who are quite unable to retain the drug when give by mouth.

Scarlet Red. Mention has been made of the use of fuchsin in the treatment of *leg ulcers*. Although both fuchsin and scarlet red are recommended for the same condition, and apparently produce the same results, they have nothing in common, aside from the fact that both are red in color. The chemical formulas are entirely different. *Fuchsin* is a mixture of hydrochloride or acetate of pararosanaline and rosanaline, while scarlet red is the sodium salt of xylene-azo-beta-naphthol disulphonic acid. It will be recalled that methylene blue, another aniline dye, has been employed for the purposes for which fuchsin and scarlet red are recommended.

The action of these dyes is not clear. It is quite probable that their value in the local treatment of ulceration lies in the fact that they are slightly irritant and thus tend to stimulate the tissues.

Davison¹ recommends scarlet red for leg ulcers. It is used in the form of an ointment of different strengths, ranging from 4 to 10 per cent. Davison prefers an ointment of 4 or 5 per cent., and occasionally employs one of 8 per cent. He has found that the stronger preparations are too irritating to the skin surrounding the wound. The ointment has been found useful in treatment of leg ulcers, burns, varicose ulcers, syphilitic ulcers, bed-sores, tuberculous ulcers, and *x-ray* burns, and ulcers resulting from trauma and infection. It aids in closing breaks in the continuity of the skin by actual proliferation from the epithelial

¹ Atlanta Journal, Record of Medicine, December, 1913.

edges of the wound, which thus results in the development of normal skin instead of scar tissue.

Scarlet red salve is not antiseptic and is not to be relied on to kill infection. Davison has found that the most successful method of application is first to cleanse the wound thoroughly with a solution of boric acid or other mild antiseptic. Irritating applications are best avoided, although in special cases hydrogen peroxide may be used if pus is present, or silver nitrate to control exuberant granulations. A 5 to 10 per cent. tincture of iodine in alcohol is the best antiseptic in infected wounds. After the foregoing preparation, a thin layer of ointment is spread on gauze large enough to cover the wound. Care should be taken to avoid covering the surrounding skin, owing to possible irritation, especially if the 8 or 10 per cent. strengths are employed. After applying the ointment, a sterile gauze pad is placed over it and kept in place with a bandage. The ulcer should be dressed every forty-eight hours, or oftener, if necessary.

In order to hasten the death of the infecting organisms, Davison sometimes combines the scarlet red with some mild antiseptic, such as boric acid, iodoform, balsam of Peru, or blue ointment.

Syphilitic ulcers and venereal and incised buboes respond more promptly to this treatment than others. On the other hand, ulcers whose surface is covered with necrotic tissue, or abundant purulent secretion, are unfavorable for the ointment. In these last mentioned cases, it is necessary to first get the ulcer as clean as possible, and then apply the salve to stimulate the rapid formation of the epithelium. While in no sense a cure, Davison considers that scarlet red is the most efficient agent we at present possess for the treatment of indolent ulcers.

Hinman¹ has been using scarlet red in the treatment of *tuberculous ulceration of the larynx* with apparently very good results. At first he tried to apply the drug to the larynx by means of a spray. This was unsuccessful as it was not possible to find a vehicle in which the scarlet red could be suspended and which at the same time could be used in an atomizer. He recommends a pigment, the base of which is equal parts of sesame oil and vaseline, with a dye strength of 10 per cent. This is applied to the larynx twice daily by means of applicators. Hinman states that the drug, in the strength of 10 per cent., is not irritating. This is somewhat surprising in a sensitive organ like the larynx, if the observations of Davison² are correct, namely, that an ointment of 8 to 10 per cent. is too irritating in the case of the ordinary leg ulcer. Hinman states that the first and most surprising result obtained was a very prompt relief of pain. This was noted in every case in which pain had been present. It was reduced in all cases and in some entirely relieved so that patients were able to eat and drink with comfort. The ulceration also showed a tendency to heal.

¹ Albany Medical Annals, February, 1914.

² Loc. cit.

Improvement was noted also in other forms of laryngeal tuberculosis, such as congestion, and infiltration and edema.

Hinman very properly points out that the cases of incipient tuberculosis of the larynx undoubtedly responded to the general treatment, so that one cannot claim that the dye was entirely responsible.

This is important to bear in mind, because there is no tuberculous lesion so amenable to treatment as an early laryngeal one. In the majority of instances all that is needed is absolute rest for the larynx through prohibiting the use of the voice, in addition to the general hygienic and dietetic measures. A very limited amount of local treatment is occasionally demanded. Nothing, however, like that recommended by Hinman. If local treatment is indicated, the ulcers may be touched up with some one of the various drugs recommended, several times a week, rarely oftener.

The use of scarlet red internally has been advised by Friedenwald and Leitz¹ in the treatment of *gastric* and *duodenal ulcer*. In their opinion, the drug is a useful adjuvant in the treatment of these conditions, and, while it cannot replace other drugs commonly used, when it is administered in conjunction with them, it frequently renders the cure more effective. They have also found it a help in the treatment of ambulatory cases. It seems to be superior to bismuth.

The use of scarlet red need not interfere in any way with the administration of other remedies, such as alkalies or belladonna, when indicated. In fact the combination of these drugs is at times most beneficial.

The dose recommended is 15 grains three times a day in $7\frac{1}{2}$ -grain lozenges.

Silver. Many years ago when silver preparations were used internally much more frequently than at present, *argyriasis* was not an uncommon occurrence. That it may be produced still by the injudicious use of the newer silver preparations is brought to mind by a case reported by Crispin.² His patient, a woman, had suffered for years from gastro-intestinal troubles and for these had been given collargol, which, on a physician's advice, she had taken for four years. When seen by Crispin, she presented a dark bluish hue not unlike cyanosis. Sunlight seemed to increase the darkness of the skin. Her condition caused her much worry and anguish.

Because of a marked anemia it was thought best to build her up prior to an operation for chronic appendicitis. During this period she developed a coryza for which Crispin prescribed 10 grains of *hexamethyl-enamin*. As a result of this treatment, the skin became several shades lighter.

At the operation, it was noted that not only the skin but the muscles and intestines had a bluish tinge.

¹ Monthly Cyclopedia and Medical Bulletin, June, 1913.

² Journal American Medical Association, May 2, 1914.

Crispin warns against the internal use of these new silver preparations for any considerable time. He also suggests that in case argyrim is encountered, hexamethylenamin be given a trial.

Several years ago I saw a most pronounced instance of argyrim in a young man who had been given one of the silver salts intravenously for one of the chronic anemias.

Strophanthin. Turnbull¹ and Nammack² both highly recommend strophanthin administered intravenously, in cases of severe decompensation, when a rapid stimulant is required. Turnbull advises that the drug be given in doses of $\frac{1}{250}$ to $\frac{1}{200}$ of a grain in a dram of normal salt solution. This, injected into a vein, will act strongly in from five to fifteen minutes. The dose may be repeated once or twice at three-hour intervals.

As strophanthin is easily altered in the stomach and intestines, and is very efficient when given intravenously, Gottlieb³ recommends it as a substitute for digitalis, when the latter is badly borne by the stomach.

Truelson⁴ states that the initial intravenous injection of strophanthin should not exceed 0.5 mg., and, if digitalis has been employed, a still lower dose must be employed. Also that three or four days must be allowed to elapse before giving this injection under these circumstances. If the pulse, respiration and diuresis are favorably influenced, even though but slightly and but for a short time, one is justified in expecting an increase and continuance of the drug's specific action from subsequent larger injections. In some instances the pulse, respiration and diuresis show no appreciable improvement, but the subjective improvement, as relief from dyspnea and oppression or a natural refreshing sleep will warrant repeated and increased injections. Contrary to Turnbull's advice, Truelson does not believe that the injections should be repeated within twenty-four hours. He states that a safe rule to follow is not to make a second injection until the benefits derived from the first one are no longer maintained. During the earlier course of the treatment three or four injections a week are sufficient; later, one only may be needed.

The average dose is 1 mg., and should only be exceeded with the full realization that one is using a powerful drug.

Theocin. Turnbull⁵ in dealing with the treatment of *heart disease* states that not infrequently in cases in which *dropsy* is considerable, it fails to clear up even when digitalis is pushed. In such cases, he says, astonishing results are often obtained by the use of theocin sodium acetate, given in one dose of 10 to 15 grains, or in three doses of 4 grains

¹ Australian Med. Journal., April 18, 1914.

² Medical Record, June 13, 1914.

³ Archives des Maladies du Cœur, des Vaisseau et du Sang, January, 1914.

⁴ Southern Medical Journal, December, 1913.

⁵ Australian Medical Journal, April 18, 1914.

each within a period of twelve hours. The patient should be well under the influence of digitalis before the theocin is given, and then a full dose is administered within twelve hours, and no more until its effect is exhausted. As theocin is distinctly a renal irritant, no good effect is obtained by continued administration.

Tuberculin. This subject was reviewed *in extenso* in last year's PROGRESSIVE MEDICINE. At present there seem to be three opinions held in regard to the use of tuberculin in pulmonary tuberculosis: (1) That which holds that all cases should receive tuberculin, and while it is admitted that the majority receive no benefit, it seems to be the only way of reaching those who seem to be helped.

(2) That which denies that tuberculin has any influence for good in the management of pulmonary tuberculosis.

(3) That which is uncertain even after conscientious use, as to whether tuberculin possesses any value or not.

The following articles reflect these different opinions. Shalet,¹ in a report of 571 cases of pulmonary tuberculosis treated with tuberculin, obtained the following results: (1) Those who were distinctly improved and apparently cured (clinically), 25 per cent.; (2) The indifferent, 60 per cent. Shalet states that 40 per cent. of these did better after the tuberculin was stopped than they had before. (3) Those who were apparently made worse, 15 per cent. Because of the number benefited, he advises the routine use of tuberculin, as otherwise the suitableness of these cases could not be determined. In those showing hypersensitivity, the tuberculin should be stopped at once.

Bardswell² has made a most interesting report on his experience with tuberculin. First in regard to the employment of tuberculin in cases without tubercle bacilli in their sputum. In 1907 and 1908, 120 such cases were treated by Bardswell in the King Edward VII Sanatorium, some with and some without tuberculin, and all were discharged apparently well. After a lapse of six to seven years only seven deaths have occurred among these patients, five from tuberculosis and two from other causes. The remainder are well. This experience makes it clear to Bardswell that the treatment of these bacillus-free patients with tuberculin is uncalled for, and that, in view of the good results obtained by simple hygienic measures, the record of such cases treated with tuberculin can supply us with no useful information as to the value of this form of treatment.

In 1912 and 1913, Bardswell treated 200 favorable cases of the early and moderately advanced types (all of which had tubercle bacilli in the sputum) with tuberculin. Contrasted with 200 similar cases treated without tuberculin in 1910 and 1911, the immediate results were precisely the same.

¹ Journal American Medical Association, April 11, 1914.

² British Medico-Chirurgical Journal, June, 1914.

One of the comparatively recent claims made for tuberculin is that it hastens the disappearance of the tubercle bacilli from the sputum. In regard to this point, Bardswell states that of the 200 cases treated with tuberculin in 1912 and 1913, 27 per cent. lost their bacilli before discharge from the sanatorium; but of the 200 cases of the same type treated without tuberculin in 1910 and 1911, the percentage figure, for those losing the bacilli, was almost identical, namely, 27.5 per cent. Rigidly excluding all cases, save those with a limited apical lesion and no constitutional symptoms, the percentage of those losing their bacilli was as high as 50 per cent., both in the case of those treated with, and those without, tuberculin.

In Bardswell's opinion, tuberculin is not a remedial agent which can be depended upon to revolutionize either sanatorium results, or the outlook for the average patient. Tuberculin has not proved itself to be a remedy in the ordinary sense of the term, and no immediate or striking results are to be expected from it, even in the most favorable cases.

As to the type of case in which it may be expected that tuberculin treatment is at least without unfavorable effect, Bardswell's experience is that it is the patient with a good outlook who has rapidly responded to general hygienic measures, and who has shown evidence of constitutional vigor and recuperative power. In a considerable number of cases, tuberculin, so far as can be judged from immediate clinical results, has no obvious influence on the lesions. While the patient is gradually made tolerant to it, this seems to be the only obvious indication of its effect. His experience has been that the routine administration of tuberculin is not a suitable method of treatment, and that its indiscriminate and careless use on a large scale can only end in harm.

Hector Mackenzie¹ states that he has used tuberculin for a number of years in a large number of cases. He has given it orally and subcutaneously; at longer and at shorter intervals and in repeated small doses, and in gradually increasing doses. This he did because of the feeling that tuberculin was entitled to a full trial; but, after all the trials he has made, he still feels uncertain as to its value.

He has yet to see absolute convincing proof that tuberculin by itself will arrest or cure or improve a larger number of cases than would have arrived at the same results without the treatment. The fact is that tuberculin as a remedy, if it is a remedy, must be put on a far lower plane than many remedies which we possess for the treatment of the disease. The most that can be claimed for tuberculin is that it promotes the natural defenses of the body, but, as Mackenzie says, this can be claimed for fresh air, for good food, for hygiene, for care, for climate, and for all the other measures we possess.

¹ Lancet, August 23, 1913.

Let it be shown that tuberculous disease in animals can be cured more readily, or arrested by means of tuberculin than without it, and we will have a reasonable basis on which to judge its value.

As I had occasion to say last year, this wide difference of opinion expressed by thoroughly competent and experienced observers cannot but make one at least skeptical as to the usefulness of this agent.

Vaccines. Vaccine therapy is at present in an unsettled state. In one instance notably, the prophylactic use of typhoid vaccines, there can be little doubt as to the assured position of this procedure. Next to the prophylactic use of typhoid vaccine, the vaccine treatment of skin infections, such as furunculosis, fistulas and superficial acne and localized collections of pus, especially when due to the staphylococci, rank next in importance. But of this latter group, while in some instances the results are brilliant, it is to be borne in mind that success may be only partial and that failure frequently occurs. Judgment as to the employment of vaccines in other conditions must, for the present, be withheld.

Rolleston¹ divides the opinions regarding vaccine therapy into three classes: (1) The optimistic, held by those who, while under the fascination of a new conception of a really rational treatment, have seen several cures in succession. This attitude is usually somewhat modified by time. (2) The pessimistic, more often expressed in private than in print, to the effect that vaccines never do any good, and that benefit apparently due to their use is either a coincidence, or is perhaps due to suggestion. (3) The doubtful or open minded; and this is the position held by Rolleston. At the present time, he contends that the results of vaccines are so uncertain that their use appears to be justified only when trustworthy therapeutic methods have failed or do not exist. He admits that good effects, sometimes dramatic in their intensity, may follow the use of vaccines.

Schröder² states that, in spite of the proved efficacy of vaccination against smallpox and typhoid fever, we are still far from Wright's prophecy of the physician of the future as an immunizer. He also considers the vaccine treatment of acne, furunculosis and chronic gonorrhea as more efficient than any other treatment, but believes that for the present this method of treatment should be confined to institutions.

In PROGRESSIVE MEDICINE for last year, several quotations were made from an article by Theobald Smith on the present-day uses of vaccines. Smith emphasized very strongly the fact that vaccines rarely, if ever, cure, but act rather in aiding a process which tends to recovery by stimulating a languid process of immunization.

¹ Lancet, February 7, 1914.

² Therapeutische Monatsschrift, February, 1914.

Pearce,¹ in an article entitled, "The Scientific Basis for Vaccine Therapy," states, among his conclusions, that: "Prophylactic vaccination rests on a sound scientific observation. Curative vaccination, on the other hand, has no sound experimental basis, but the application of the general principles of immunity as well as clinical observations offers a plausible basis for the treatment of localized, more or less chronic infections, and of 'carriers.' No satisfactory basis is at hand for curative vaccination in the acute, self-limited diseases characterized by general dissemination and systemic infection."

Pearce considers that all attempted vaccinations in this group must be considered as purely experimental. He recalls that Wright considered that vaccine therapy demanded "a man who has spent years of study to master the technique; to know how to make the vaccines, to know where to look for the microbes, to know which are the most important microbes, to know how to isolate them, and most of all, a man with sufficient experience and ability to apply all these things." Finally, Pearce condemns the use of anything but autogenous vaccines in diseases of doubtful or unknown etiology.

While not original with the Medical Corps of the United States Army, there is no question but that the brilliant results obtained by this organization has had much to do with the general adoption of typhoid vaccination.

It will be recalled that vaccination against typhoid fever became compulsory in the United States Army several years ago. Splendid as the results of former years have been, they have been far surpassed by those obtained for the year 1913. These results have been published by Russel.² In the entire Army of over 90,000 men, only 3 cases of typhoid fever, with no fatalities, have occurred during the year 1913.

The following tables are self-explanatory and show at a glance the improvement that has taken place since vaccination was introduced:

TABLE 1.—TYPHOID FEVER, ENLISTED AMERICAN TROOPS SERVING IN U. S. PROPER.³

Year.	Mean strength.	Absolute cases.	Number deaths.	To each 1000 soldiers of the command the ratios are:	
				For cases.	For deaths.
1907	35,132	124	7	3.53	.19
1908	46,316	136	11	2.94	.23
1909	57,124	173	16	3.03	.28
1910	55,680	129	9	2.32	.16
1911	55,240	44	6	0.80	.11
1912	58,119	15	2	0.26	.03
1913	59,608	2	0	.03	.00

¹ Journal American Medical Association, December 13, 1913.

² *Ibid.*, May 2, 1914.

³ The vaccination was voluntary in 1909, 1910, and part of 1911, but compulsory in part of 1911 and in 1912 and 1913.

TABLE 2.—NUMBER AND PROPORTION OF TYPHOID CASES CONTRACTED BEFORE ENLISTMENT AND AMONG THE PROTECTED (UNITED STATES PROPER ONLY) OFFICERS AND ENLISTED MEN.

Year.	Total cases.	Total deaths.	Infected prior to enlistment.	No. cases.	Among the Vaccinated. No. deaths.
1909	173	16	?	1	0
1910	129	9	?	4	0
1911	44	6	?	7	0
1912	18	3	5	6	0
1913	2	0	2	0	0

TABLE 3.—TYPHOID FEVER, 1907 TO 1913, FOR THE WHOLE ARMY, OFFICERS AND ENLISTED MEN, AMERICAN AND NATIVE TROOPS.

Year.	Mean strength.	No.	Ratio per 1000 of Mean Strength.	No.	Ratio per 1000 of Mean strength.	Percentage of total cases.	Occurring among those who were vaccinated. Cases. Deaths.
1907 . .	62,523	237	3.79	19	.30	8.0	.. ..
1908 . .	74,692	239	3.20	24	.31	10.0	.. ..
1909 . .	84,077	282	3.35	22	.26	7.8	1 0
1910 . .	81,434	198	2.43	14	.17	7.1	0 0
1911 . .	82,802	70	.85	8	.10	11.4	11 1
1912 . .	88,478	27	.31	4	.044	14.8	8 0
1913 . .	90,646	3	.03	0	.0	0.	1 0

The question is not infrequently asked by laymen, "Is there any danger from being given typhoid vaccine?" Russell states that this question may be definitely and decisively answered by the plain statement that no harmful effects have been produced. In regard to the effect of typhoid vaccination on *tuberculosis*, Russell states that the case rate for tuberculosis of all kinds shows a decrease from 4.51 per thousand for the decennial period ending 1911 to 3.49 for the year 1912, a decrease of 22 per cent. Furthermore, the records show not only that tuberculosis has not increased since the introduction of typhoid vaccination, but that it has actually decreased, a result due, no doubt, to improved sanitation, and to the care used in the physical examination of recruits. Inasmuch as the question has been raised frequently that a latent tuberculosis might be unfavorably influenced by giving the vaccine, it is interesting to note that, in Russell's opinion, there is not the least danger.

The above statement seems to indicate pretty conclusively that typhoid vaccines have not produced an increase in the tuberculosis rate in the army. In spite of this fact, however, it would seem much safer to administer the vaccine with a good deal of caution to an individual who was positively known to have tuberculosis. In such a case, it would be better to divide the initial dose into two or three small ones; if these are well borne, the second and third doses could be given as usual, or, if necessary, these also could be divided.

Hukke¹ reports 11,007 cases receiving prophylactic doses of typhoid vaccine at the Jefferson Barracks, a recruit depot. In all, 33,021 injections were given without the occurrence of a serious after-effect.

He states that children bear the prophylactic injection very well, and that, in some instances, it has been administered to children as young as three years. It has also been noted that children do not react so severely as adults. The dose for a child is in proportion to its weight, the basis being a man of 150 pounds. It is always best to give a little more rather than a little less than the exact dose. Hukke states that all the families on the post are encouraged to have their children vaccinated against typhoid, and that, as a rule, this advice is followed.

Bosisio² believes that the intravenous administration of the vaccine for prophylactic purposes is preferable to the subcutaneous, in that it gives a longer period of immunity. The method is mentioned as of some interest. It is hardly likely, however, that it will be adopted generally, not only because it adds to the difficulty in administering the vaccine, but also because of the entirely satisfactory results obtained by the present method.

Among the rules he lays down for avoiding infection with the bacillus typhosus, Jordan³ advises vaccination against the disease in all instances in which any special exposure is known or feared.

It was perhaps only natural that the brilliant results obtained from the prophylactic use of typhoid vaccine would lead to its employment in the treatment of typhoid fever itself. The administration of the vaccine under these circumstances, however, is one of the things against which Theobald Smith warned us last year. "In processes associated with fever and bacteriemia, Science says: Hands off until we know whether we have a progressive disease with gradual undermining of the resistance, or a more localized affection in which the excursions into the blood are secondary. In any case, the use of vaccines in these cases must be regarded as experimental, and should not be undertaken save in conjunction with one trained in immunological problems." In the reports so far made, while there is no indication that the vaccines have been of any special value, they apparently have been without harm.

During the past year reports on the use of typhoid vaccine in the treatment of the disease have been made by Walters,⁴ Pensuti,⁵ Guinon and Malarte,⁶ Kahn,⁷ Hornor,⁸ and Luders.⁹ Several of the reports

¹ Illinois Medical Journal, October, 1913.

² Polyclinico, November 9, 1913.

³ Journal American Medical Association, June 6, 1914.

⁴ Medical Record, September 20, 1913.

⁵ Polyclinico, December 14, 1913.

⁶ Bulletins de la Société de Pédiatrie, January, 1914.

⁷ Journal Texas State Medical Society, February, 1914.

⁸ Boston Medical and Surgical Journal, June 25, 1914.

⁹ Therapeutic Gazette, October, 1913.

seems to show that the course of the disease was shortened and one distinctly states that no such effect was noted. All the reporters but one stated that the vaccine has no influence in reducing the number of complications.

The use of vaccines in localized collections of pus, especially the *skin infections* has given excellent results, although not by any means uniformly so. Gilchrist¹ has reported his experience for the past six years in this type of infection. His results have been brilliant in some instances, moderately successful in others, and, in still others, he has many failures to record. The degree of success has been about the same for each of three groups. Gilchrist emphasizes that whenever an organism is obtained in pure culture from a case of skin infection, the proper treatment is the use of an autogenous vaccine, especially if the condition is chronic or subacute; or when the disease is acute, and it does not yield to the usual modes of treatment.

The vaccines are of great value in the treatment of relapsing furunculosis, sycosis vulgaris, pustular dermatitis and folliculitis, and especially so if the infection is due to staphylococci.

In some conditions, Gilchrist has obtained excellent results with stock vaccines. In an experience with 400 cases of acne, his results have been as good with a stock bacillus acne vaccine as from the autogenous one. He has also successfully employed ointments made up with various skin organisms.

Einsiedel² reports 82 per cent. cured and 18 per cent. improved in his cases of furunculosis. He has obtained excellent results in acne, reporting 16 per cent. cured, and 84 per cent. as having improved.

Messerschmidt³ employed autogenous vaccines in 16 cases of chronic furunculosis and obtained a cure in 14 of them.

Good results have been obtained from time to time in infections of the *urinary tract* due to the colon bacillus. A very encouraging report has been made by Wulff,⁴ on the use of vaccines in affections of the urinary organisms. One group of cases, numbering 23, is of special interest. In these patients the trouble began suddenly, with pains in the loins, high fever, and sometimes chills or pyuria. In the majority of them, there had been recurring attacks of this nature for some time. The acute febrile attack was arrested at once by the vaccine, and, at the same time, the tendency to recurrence was cured. Wulff explains these cases as being the result of some infectious focus outside of the urinary passages. When the bacteria from this focus get into the blood-stream from any cause, this brings on an acute attack as the bacteria reach the kidneys. After the invasion of the blood-stream ceases,

¹ Journal of Cutaneous Diseases, December, 1913.

² Quoted by Schröder, loc. cit.

³ Münchener med. Wochenschrift, June 30, 1914.

⁴ Zeitschrift f. Urologie, September, 1913.

the kidney irritation also ceases, either healing completely or becoming latent only to flare up again if a fresh invasion of bacteria occurs. The vaccines cure either by healing the original focus, or by reinforcing the body defenses, so that they are able to resist the bacterial invasion.

He obtained an apparent cure in 21 of the 23 cases. In all but one, the colon bacillus was responsible for the trouble; in one instance, streptococci were the exciting cause.

In another group of 19 patients with a more chronic infection, all were cured or improved but one. Albumin and pus disappeared from the urine, but bacteriemia sometimes persisted. If the condition is associated with renal calculi, the results are naturally not so good.

Last year reference was made to the employment of vaccines in the treatment of *whooping cough*. Kelsall¹ reports on the use of a stock vaccine for this disease, which he used in 30 cases. His conclusions are that pertussis vaccine constitutes the most potent and successful remedy at our command for the treatment of this disease, and possibly also for its prevention. In common with the reports mentioned last year, Kelsall states that the vaccine renders the paroxysms milder and less frequent. He also believes that it shortens the disease, and aids in preventing complications. The initial dose, in his opinion, should be much larger than that usually recommended, at least for children of five years and older.

Venesection. This procedure, once so popular with our forefathers, has had the not uncommon experience of other therapeutic measures. From being an exceedingly common practice, bleeding finally fell into almost complete oblivion. Indeed within the past two generations it not infrequently happened that men with a wide experience had never performed venesection. While it never fell into complete disuse, reference to the subject in the literature has not been frequent. During the past year, however, venesection has been referred to a number of times. This is due in large measure to our increasing knowledge of cardiovascular disorders, and, in fact, several of the references deal with the management of arterial hypertension.

Rudolf² states that in many cases venesection is the most powerful method of treatment at our command, and, if used with discretion, seems to be free from any ill-effects. Instead of cutting the vein and skin with one incision or exposing the vein and thus nicking it, Rudolf advises the following method. He punctures the vein through the skin with a sharp needle 2 mm. in diameter. The blood flows freely through this, and if a piece of tubing, previously filled with water, be attached to the needle, and this be led into a vessel, then as much negative pressure may be used as desired, and the chances of clotting occurring in the needle are lessened. Some years ago, while doing some experimental

¹ Therapeutic Gazette, January, 1914.

² Canadian Medical Association Journal, April, 1914.

work, I obtained blood in any desired quantity by direct puncture of the vein through the skin. It is easily done, and, with proper sterilization of the skin, entirely free from the danger of infection.

Rudolf gives the following conditions as *indications for venesection*: Heart failure, acute or chronic, with marked cyanosis; acute toxemias, such as acute uremia; acute infections, such as pneumonia and typhoid fever (in regard to the later condition, it is difficult to see how venesection would be of value, on the contrary, it would appear to be a dangerous procedure); chronic toxemias, especially those associated with high blood-pressure; and occasionally in cases in which we wish to increase the coagulability of the blood, as in deep hemorrhages, and in aneurysms.

In regard to the last indication, it is interesting to note that Liuthlen¹ has shown experimentally that blood-letting exercises a favorable effect in decreasing the abnormal permeability of the vessels. In some way both the injection of blood and serums and the repeated withdrawal of blood from the circulation may bring about the same result. The effect of blood-letting in decreasing the permeability of the vessels recalls also the old practice of bleeding in conditions attended with the undue formation of transudates or exudates, as in pneumonia or pleurisy.

According to Hall,² venesection is indicated in cases with high blood-pressure when the patient is unconscious and cerebral hemorrhage is feared. MacFarlane³ insists that it is a fact beyond dispute that any patient suddenly becoming unconscious or presenting symptoms of cerebral insult, with a blood-pressure of more than 200 mm., should be bled immediately. Hall also advises immediate bleeding in convulsive cases attended with high tension. In cases of the types just mentioned, he believes that the timely abstraction of from 10 to 20 ounces of blood will often be attended with a most satisfactory result. Hall advises the use of the sphygmomanometer in cases of coma as, by this means, he states, one is able to distinguish between coma due to a hemorrhage and that caused by thrombosis, as in the latter condition the blood-pressure is invariably low.

Llewellyn⁴ states that he has never regretted performing venesection in cases of high tension, but, on the other hand, has very often regretted that in cases in which it was clearly indicated he was, owing to the prejudices of the patient, or his friends, not given the opportunity before the patient was *in extremis*. Llewellyn believes that the defect in the text-book teaching regarding blood-letting is that the operation is recommended only when a stage has been reached in which failure is almost a foregone conclusion. Lichy⁵ and Piersol⁶ also recommend blood-letting in high tension cases.

¹ Medizinische Klinik, 1913, vol. ix.

² Clinical Journal, May 23, 1914.

³ Medical Record, January 10, 1914.

⁴ Australasian Medical Gazette, October 11, 1913.

⁵ American Journal Medical Sciences, May, 1914.

⁶ Therapeutic Gazette, September, 1913.

As one of the means of controlling fully developed *eclampsia*, Newell¹ recommends venesection. Fordyce Barker's indication for bleeding in *eclampsia* was as follows: "When the attack occurs before labor, if the pulse be strong and hard, with fullness of the vascular system, and when the appearance of the face indicates vascular congestion, bleed at once." Zinke² states that as a guide for bleeding this advice is as true today as ever before. In regard to the employment of venesection in cases of *uremia*, Piersol³ states that the lowering of the pressure is, as a rule, only temporary. The good results in these cases as in *eclampsia* also, may be due to the withdrawal of a certain amount of toxic material.

Veratrum Viride. The use of *veratrum viride* in the treatment of *eclampsia* was first recommended by Parvin. Since that time its use has been advised from time to time by others. Zinke⁴ has employed the drug for several years. Whenever the condition of the patient and the environment permit, he advises the following plan: If the patient has, or has had, convulsive seizure, 25 drops or 15 minims of Norwood's tincture of *veratum viride* (especially prepared and kept for this purpose) are given hypodermically, and this dosage is repeated every hour until the pulse is reduced to 60 per minute, or less. If, within an hour, the pulse should fall from 150 to 100, only 10 drops of the *veratrum* are to be injected in the succeeding dose, no matter whether this be the second, third, or fourth dose. More than two or three full doses are rarely necessary to bring the pulse to 60. Zinke believes that *veratrum viride* thus administered is the most valuable remedy in the treatment of *eclampsia*.

Veratrone is also highly recommended in *eclampsia* by Jardine.⁵ He states that many years ago he tried *veratrum viride*, but abandoned its use, because the effect was very uncertain. When its active principle, *veratrone*, was introduced, he again took up the use of the drug with very good results, especially in those cases in which the pulse rate and tension are high. He cites cases in which pulse rates were reduced from 140 or 130 to 60 or 70 per minute within half an hour. The drug has a very powerful effect, and, when it is used after delivery, the depression may be alarming. In one case the patient looked as if she were dying, but a hypodermic of $\frac{1}{30}$ grain of strychnine quickly rallied her.

Haultain⁶ also reports favorably on the use of *veratrone* in the treatment of *eclampsia*.

In addition to its depressant action on the heart, *veratrone* also aids in controlling the convulsive seizures by depressing the spinal cord in its motor tracts.

¹ Bulletin of Lying-in Hospital of the City of New York, January, 1914.

² American Journal of Obstetrics, June, 1913.

³ Loc. cit.

⁴ American Journal of Obstetrics, June, 1913.

⁵ British Medical Journal, January 17, 1914.

⁶ Edinburgh Medical Journal, October, 1913.

The drug is administered hypodermically and is supplied in ampoules of 1 c.c., equaling 20 minims of the tincture of veratrum viride (B. P., 1885).

Veronal. There have been several references in the literature during the past year, to instances of poisoning from over-doses of veronal. While cases have been recorded in which a fatal result occurred from the ingestion of as little as 10 grains of the drug, most of the fatalities followed enormous doses.

Russell and Parker¹ report a fatal case in which the amount taken was believed to be somewhere between 15 and 50 grains. On the other hand, Munro² records a case in which recovery took place after the ingestion of 125 grains. Munro refers to several other instances in which recovery followed the ingestion of 125 and 135 grains, respectively.

Fortunately, death does not occur for some hours, even after enormous doses. This gives an opportunity to combat the effects of the drug. The treatment of acute poisoning is outlined by Hare³ as follows:

The stomach should be washed out with a stomach-tube, and then followed by pouring into the stomach, through the tube, one-half to one pint of strong black coffee, following it with an ounce of castor oil or other purgative. Strychnine and digitalis are also advantageous, and warm normal salt solution may be given subcutaneously or by the rectum. Oxygen inhalations may be employed. Care should be taken to examine the bladder, lest it suffer from paralytic distention. Should there be suppression of urine, caffeine may be given hypodermically, or camphor and pituitrin may be employed. In those cases in which the symptoms persist over many hours, the question of feeding by means of the stomach-tube is an important one.

While the drug is safe in the dose usually employed (7.5 grs.), it should be used cautiously in patients with renal disease. Patients who are habitually constipated also seem to develop toxic symptoms easier than those who have been freely purged, or whose bowels move regularly.

Occasionally instances of the "veronal habit" are encountered. An individual addicted to the habit sometimes develops visual hallucinations and delusions, and there may be tremors and marked atoxia. The gait at times resembles that of a person intoxicated with alcohol. As in all drug habits, the moral sense is apt to be lost.

Pernet⁴ reports two cases in which a severe skin eruption followed the use of small doses of veronal. He also had a similar experience with the recently introduced hypnotic *luminal*, which is very similar to veronal. In one of his cases the skin rash took the form of a severe bullous eruption.

¹ British Medical Journal, April 18, 1914.

² Ibid.

³ Therapeutic Gazette, February, 1914.

⁴ British Medical Journal, August 9, 1913.

INDEX.

A

ABDERHALDEN's test in gastro-intestinal diseases, 59
Abdominal viscera, examination, 41
Abortion, incomplete, pituitrin in, 385
Abscess of testicle, 161
Accidental wounds, 195
Achyria gastrica, 48
 pancreatica, 104
Acid, nitro-muriatic, 380
Actinomycosis, 213
Acute congestion of liver, 91
 dilatation of stomach, 54
 hepatitis, 91
Adrenalin, 349
 in asthma, 349
 in gastric hemorrhage, 350
 in hematuria, 349
 in osteomalacia, 350
Adrenals, gastric ulcer and, 26
Aerophagy, 56
 rectal, 57
Alcohol, 299
Alimentary galactosuria, 86
Alypin poisoning, 166
Amblyopia, quinine, 390
Anacidity, gastric, 47
Anastomosis, arterio-venous, 254
 of vas deferens, 164
Anesthesia, 181
 deaths from, 183
 local, 184
Aneurysms, 238
 arterial, in war, 242
 arterio-venous in war, 244
 resection of, venous transplant after, 246
Antidiphtheritic serum, 301
Antimeningococcic serum in acute gonorrhoeal epididymitis, 160
Antipepsin, 26
Antipneumococcic serum, 308
Antiseptics, urinary, 166
Antistreptococcic serum, 309
Antitetanic serum, 311
Antitoxin, diphtheritic, 301
 prophylactic use of, 304
Anuria, postoperative, 181
Appendicitis, 76
 hematuria in, 136
 simulating coxalgia, 77
 renal colic, 77
Argyriasm, 393
 hexamethylenamin in, 393
Arsenic, 319

Arterial aneurysms in war, 242
 hypertension, digitalis in, 340
Arteries, large, ligation of, 247
Arteriosclerosis, nitrites in, 377
Arterio-venous anastomosis, 254
 aneurysms in war, 244
Artificial epidermization, 268
Ascites, 83
 eosinophile, 84
Asthma, pituitrin in, 387
Atophan, 320
Atresia of duodenum, 67
Atropine, 321
 in gastric disease, 54
Auricular fibrillation, digitalis in, 341
Auto-intoxication, 70

B

BENZINE, 322
Benzol, 323
 in leukemia, 323
Bile in treatment of gastric hyperacidity, 46
Bladder, 142
 diverticula of, resection of, 144
 congenital, operation for, through perineum, 145
 tumors of, 142
Blastomycosis, 271
Blood, 229
 coagulation of, 229
 effect of high altitude on, 349
 serum, 325
 transfusion in hemorrhage, 184
Bloodvessels, 233
 conditions influencing passage of fluid from, to tissues, 107
Boils, nitro-muriatic acid in, 380
Bone cavities, 291
 cysts, 298
 transplantation of, 280
 and joints, surgery of, 280
Bromide of sodium, 326

C

CAFFEINE, 327
Camphor, 329
 in pneumonia, 330
 in pulmonary tuberculosis, 331
Cancer. *See* Carcinoma, 217
Carbuncle, 212
Carcinoma of colon, 75

Carcinoma, control, 217
 of duodenum, 67
 education in, 219
 of epididymis, primary, 161
 of esophagus, 23
 experimental, 226
 mammary, benzol in, 324
 mortality from, estimation of, in continental United States, 221
 of penis, 150
 prophylaxis of, 219
 of prostate, 148
 of skin, danger of, 270
 of stomach, 30
 cardiac sign in, 31
 cytodiagnosis of, 32
 x-ray examination in, 31
 of testicle, 157
 what everyone should know about 223

Cardiac and renal disease, dyspnea in, 114

Cardiospasm, 18

Cavities, bone, 291

Cecum mobile, 77

Cerebral hemorrhage, 179

Chancre, urethral, 156

Chemotherapy, 331
 in cancers, 333

Chlorophyl test of gastric motility, 50

Cholelithiasis, 95
 pathogenesis of, 95

Chronic intestinal stasis, 68
 ulcerative colitis, 74

Circulatory disturbances, acute, pituitrin in, 387

Cirrhosis of liver, 84
 experimental production of, 90
 treatment of, medical, 90

Citrate of copper in gonorrhea, 156

Coagulène Kocher-Fonio, 230

Coagulose, 325
 in hemorrhagic disease of newborn 325

Cocaine, 334

Coley's fluid, 335
 in inoperable sarcoma, 335

Colitis, ulcerative, chronic, 74

Collargol in cystitis, 144

Colloidal nitrogen test in gastric carcinoma, 33

Colon bacilli, clumped, 27
 carcinoma of, 75

Conditions influencing passage of fluid from bloodvessels to tissues, 107

Constipation, 72
 chronic, liquid petroleum in, 380
 hormonal in, 72
 istizin in, 73
 sennatin in, 73

Corpus luteum, extract of, 336
 in dysmenorrhea, 337

Crotolin, 337
 in epilepsy, 338

Cystitis, treatment of, collargol in, 144

Cytodiagnosis of stomach, 37

Cysts, bone, 298

DANGER of cancer of skin, 270
 of pyelography, 128

Deformity of outline in duodenal ulcer, 64

Delirium tremens, sodium bromide in, 326

Diagnostic value of eosinophilia in surgical disease of prostate, 147

Dietetic treatment, 49

Digitalis, 339
 in arterial hypertension, 340
 in auricular fibrillation, 341
 effect of, on blood-pressure, 339
 on heart during exercise, 340
 limitations of, 341
 in uterine hemorrhage, 342
 of esophagus, 21

Diphtheria, 214
 carriers, treatment of, 304
 antitoxin, 301

Diseases of pancreas, 103

Distention, postoperative, 180

Diverticula of bladder, resection of, 144

Diverticulum, dilatation of esophagus, and, 18

Dropsy, renal, 107
 theocin in, 394

Dry test meal, 44

Duodenal feeding, 66
 juice in icterus, 95
 tube, 104
 ulcer, 60

Duodenum, atresia of, 67
 carcinoma of, 67
 injuries to, during nephrectomy, 137

Dysentery, amebic, quinine in, 389

Dysmenorrhea, extract of corpus luteum in, 337

Dyspnea in cardiac and renal disease, 114

E

ECLAMPSIA, venesection in, 404
 veratrum viride in, 404

Edestin and pepton in gastric carcinoma, 34

Embolism of femoral artery, successful operation for, 245

Emetine, 342
 in amebic dysentery, 342
 in hemoptysis, 347
 in sprue, 347

Enemata, nutritive, 78

Eosinophilia in surgical disease of prostate, 147

Epidermization, artificial, 268

Epididymis, carcinoma of, primary, 161

Epididymitis, operative treatment of, 159
 gonorrhreal, acute, antimeningococcal serum in, 160

Epilepsy, crotal in, 338

Epinephrin, 349
 in asthma, 349
 in gastric hemorrhage, 350

Epinephrin in hematuria, 349
in osteomalacia, 350
Epiphanian test in gastric carcinoma, 34
Esophagitis, 22
Esophagus, carcinoma of, 23
dilatation of, 21
diseases of, 18
diverticulum, dilatation and, 18
rupture of, spontaneous, 24
Estimation of amino-acids as test of
hepatic insufficiency, 89
Eucalyptol oil, 350
in measles, 350
in scarlet fever, 350
Examination of empty stomach, 44
Exercise, 356
Extract of corpus luteum, 336

F

FASCIA transplantation of, 260
Feeding, duodenal, 66
parenteral, 78
Fibrinogen, 88
Free transplantation of tissue, 277
Fresh air, 350
Friedmann's cure in tuberculosis, 358
Frost bites, 247
Fuchsin, 362
in leg ulcers, 362
Functional diagnosis, of kidney disease,
131
test of heart, 178
of hepatic insufficiency, 84
Furuncles, 211
sulphuric acid in, 212

G

GALACTOSURIA, alimentary, 86
Gall-bladder, effect of foreign bodies in,
on gastric secretion, 97
has removal of, any deleterious
effects, 99
Gall-stones, gastric secretion and, 97
intestinal obstruction due to, 74
intrahepatic, 97
solubility of, 99
x-ray diagnosis of, 98
Gangrene, 247
Gastric carcinoma, 30
cardiac sign in, 31
cytodiagnosis of, 32
specific laboratory tests for, 32
x-ray examination in, 31
Gastric crises not due to tabes, 59
diagnosis controlled by operation, 39
dilatation, acute, 54
disease, atropine in, 54
pancreatic secretion in, 106
disturbance after gastro-enteros-
tomy, 28
lavage, 51
with ichthysol, 51
secretion, gall-stones and, 97

Gastric tetany, 55
ulcer, 24
adrenals and, 26
experimental production of, 24
heredity in, 28
localization of, 30
perforated, 29
treatment of, 30
Gastro-enterostomy, gastric disturbance
after, 28
recurrence of ulcer after, 29
Gastro-intestinal diseases, Abderhalden's
test in, 59
hemorrhage, 79
Genito-urinary organs, infection of, with
influenza bacillus, 165
operations on, hiccup
after, 164
Glycosuria as a sign of pancreatitis,
105
Glycyltryptophan test in gastric carcinoma, 34
Gonococcus, new culture medium for,
166
Gonorrea, citrate of copper in treatment,
of, 156
iodine in treatment of, 153
Granulating wounds, 205
Gunshot wounds, 188

H

HAIR balls in stomach, 58
Hand, phlegmons of, 208
Heart, functional test of, 178
Heliotherapy, 353
Hematuria in appendicitis, 136
Hemoglobinuric fever, quinine in, 389
Hemorenal index, 135
Hemorrhage, 184
blood-transfusion in, 184
cerebral, 179
gastro-intestinal, 79
uterine, digitalis in, 342
Hemorrhagic disease of newborn, blood-
serum in, 325
Hepatic insufficiency, functional tests of,
84
Hepatitis, acute, 91
Hexamethylenamin in argyria, 393
as urinary antiseptic, 362
Hiccup after operations on genito-
urinary organs, 164
Hydrocele, purulent, due to pneumo-
coccus infection, 160
Hydrochloric acid, methods of testing
for, 44
Hydronephrosis, 141
Hydrotherapy, 365
Hyperacidity, gastric, 45
Hyperchlorhydria, bile in treatment of,
46
and hyperthyroidism, 47
Hypermotility in duodenal ulcer, 63
Hyperperistalsis in duodenal ulcer, 63
Hypertonus in duodenal ulcer, 64

I

ICTERUS, 94
duodenal juice in, 95
Indications for venesection, 403
Infections, 206
general, 206
treatment of, 206
of genito-urinary organs with influenza bacillus, 165
local, 208
of skin, vaccines in, 401
of urinary tract, vaccines in, 401
Injuries to duodenum during nephrectomy, 137
local effect of, 188
results of nerve suture for, 273
Intestinal obstruction, 73
due to gall-stone, 74
sand, 77
stasis, chronic, 68
liquid petroleum in, 380
pituitrin in, 386
Intestine, diseases of, 60
large, 67
functions of, 67
small, 60
Intrahepatic gall-stones, 97
Iodine, 369
in gonorrhea in women, 370
as skin disinfectant, 369
in treatment of gonorrhea, 153
in tuberculosis, 372
renal, 372
in tuberculous adenitis, 372
in vaginitis, 370
in vulvitis, 370
Iodoform, substitutes for, 204
Iron, 372
Istizin in constipation, 73

J

JOINTS, bones and, surgery of, 280

K

KIDNEYS, diseases of, 107
effects of torsion on, 111
floating, 123
rupture of, 128
sarcoma of, in infancy, 127
ureters and, 123

L

LAGGING of bismuth in duodenal ulcer, 64
Larynx, tuberculous ulceration of, scarlet red in, 392
Lavage of stomach, 51
with ichthysol, 51
Leather-bottle stomach, 35
Leg ulcers, scarlet red in, 391

Lesions of special tissues, 229
Leukoeytosis, 231
Leukemia, benzol in, 323
Ligation of large arteries, 247
Ligature material, 204
Limitis plastica, 35
Liver, cirrhosis of, 84
cirrhosis of, experimental production of, 90
treatment of, medical, 90
congestion of, acute, 91
diseases of, 84
x-ray of, 92
Local anesthesia, 184
effect of injuries, 188
Luminal, 405

M

MALIGNANT degeneration of ectopic testicle, 158
Malaria, quinine as prophylactic against, 388
Mammary carcinoma, benzol in, 324
Measles, eucalyptol oil in, 350
Meiostagmin test in gastric carcinoma, 34
Mercuric chloride, poisoning from tablets of, 374
Mercury, 374
Motility of stomach, 48
Mouth, disease of, 17
infections and their relations to constitutional disease, 17
Muscles, 253
Myositis ossificans progressiva, 255

N

NEPHRECTOMY, injuries to duodenum during, 137
Nephritis, 119
excretion of urinary solids in, 119
experimental, water-content of tissues in, 111
Nerve suture for injury, results of, 273
Nerves, 273
New culture medium for gonococcus, 166
Nitrites, 375
action of, and drugs of digitalis group on isolated coronary artery, 376
on isolated surviving pulmonary artery, 376
in arteriosclerosis, 377
Nitro-muriatic acid, 380
Nutritive enemata, 78

O

OCCULT blood in duodenal ulcer, 62
Operation for embolism of femoral artery, 245
Operative wounds, 197

P

PANCREAS, diseases of, 103
 Pancreatic insufficiency, quantitative estimation of, 104
 secretion in gastric disease, 106
 Pancreatitis, glycosuria as a sign of, 105
 Parenteral feeding, 78
 Penis, urethra and, 150
 carcinoma of, 150
 Perforated gastric ulcer, 29
 Peritoneal cavity, sensibility of, 80
 Peritoneum, diseases of, 80
 Peritonitis, tuberculous, 82
 Petrolatum, 380
 liquid, 380, 381
 in chronic constipation, 380
 Phenolsulphonephthalein test, 131
 Phenoltetrachlorphthalein, 88
 Phlegmons of hand, 208
 Pituitrin, 382
 in acute circulatory disturbances, 387
 in asthma, 387
 contra-indications to, 383
 as an ecbolic, 382
 in hemorrhages, 387
 in incomplete abortion, 385
 in intestinal stasis, 386
 Pneumonia, camphor in, 330
 postoperative, 180
 Poisons from tablets of mercuric chloride, 374
 Polyp of stomach, 58
 Postoperative anuria, 181
 complications, 179
 distention, 180
 hemorrhage, 179
 tetanus, 216
 Preoperative investigation, 175
 Prostate, 146
 carcinoma of, 148
 Prostatectomy, 146
 Pulmonary tuberculosis, camphor in, 331
 Purulent hydrocele due to pneumococcus infection, 160
 Purpura, visceral lesions of, 79
 Pyelitis in infancy and childhood, 138
 Pyelography, 116
 dangers of, 128
 in diagnosis of renal disease, 116
 Pyloric disharmony, 24
 insufficiency, 25
 Pylorospasm, 24, 47
 Pyorrhea alveolaris, radium radiations and, 17

Q

QUININE, 388
 amblyopia, 390
 in amebic dysentery, 389
 as prophylactic in malaria, 388
 in rabies, 390
 in sciatica, 390

R

RABIES, quinine in, 390
 Radiologic signs of duodenal ulcer, 63
 Radium emanations, pyorrhea alveolaris and, 17
 Rectal aerophagy, 57
 Recurrence of symptoms after operation in duodenal ulcer, 65
 of ulcer after gastro-enterostomy, 29
 Renal disease, dyspnea in, 114
 pyelography in diagnosis of, 116
 dropsy, 107
 Resection of diverticula of bladder, 144
 Rheumatic tetanus, 215
 Rheumatism, articular, acute, sodium salicylate in, 390
 Rib as an autotransplant, 284
 Rupture of kidney, 128
 of long biceps tendon, 256

S

SAHLI's test-meal of gastric motility, 50
 Salomon-Saxl urine-sulphur test in gastric carcinoma, 33
 Sand, intestinal, 77
 Sarcoma, inoperable, Coley's fluid in, 335
 of kidney in infancy, 127
 of testicle, 157
 Scar tetanus, 215
 Scarlet fever, eucalyptol oil in, 350
 red, 391
 in duodenal ulcers, 393
 in gastric ulcers, 393
 in leg ulcers, 391
 in tuberculous ulceration of larynx, 392
 Sciatica, quinine in, 390
 Seminal ducts, x-ray studies of, 162
 vesicle, intravesicle cyst of, 163
 Sennatin in constipation, 73
 Sensibility of peritoneal cavity, 80
 Serum, antidiphtheritic, 301
 antipneumococcal, 308
 antistreptococcal, 309
 antitetanic, 311
 Shock, 169
 general, 169
 operative, 178
 preoperative investigation and treatment, 175
 treatment of, 174
 Shoulder, snapping, 255
 Silk for tendon plastics, 260
 Silver, 393
 Six-hour residue in duodenal ulcer, 63
 Skin, 267
 carcinoma of, danger of, 270
 homoplastic transplantation of, 267
 infections, nitro-muriatic acid in, 380
 tuberculosis of, 272
 Snapping shoulder, 255
 Sodium bromide, 326
 in delirium tremens, 326

Sodium salicylate, 390
 in acute articular rheumatism, 390

Solubility of gall-stones, 99

Sources of error in use of stomach-tube, 42

Special tissues, lesions of, 229

Steroline, 203

Stomach, carcinoma of, 30
 cardiac sign in, 31
 cytodiagnosis of, 32
 specific laboratory tests for, 32
 x-ray examination in, 31
 cytodiagnosis of, 37

diseases of, 24

empty, examination of, 44

hair balls in, 58

leather-bottle, 35

motility of, 48
 chlorophyl test of, 50
 Sahli's test meal, 50

polyp of, 58

-tube, sources of error in use of, 42

tuberculosis of, 57

Stricture of ureter, 117

Strophanthin, 394

Substitutes for iodoform, 204

Sulphuric acid in furunculosis, 212

Surgery of bones and joints, 280

Suture and ligature material, 204

vessel, 235

T

TABETIC crises, x-rays and, 59

Tendons, 255
 long biceps, rupture of, 256
 platics, silk for, 260
 transplantation of, 258

Test, Abderhalden's, 59
 chlorophyl, 50
 colloidal nitrogen, 33
 epiphanin, 34
 glycyltryptophan, 34
 meal, dry, 44
 Sahli's, 50
 meiostagmin, 34
 phenolsulphonephthalein, 131
 Salomon-Saxl urine-sulphur, 33
 Wolff-Junghans, 32

Testicle, abscess of, 161
 carcinoma of, 157
 ectopic, malignant degeneration of, 158
 sarcoma of, 157

Tetanus, 214
 after injuries without demonstrable lesion of skin, 215
 non-traumatic, 214
 postoperative, 216
 rheumatic, 215
 scar, 215
 through a pathological lesion of skin, 216

Tetany, gastric, 55

Tetrahydro-B-naphthylamine hydrochloride, 26

Theocin, 394
 in dropsy, 394

Therapeutic referendum, 300

Thread tests in duodenal ulcer, 63

Torsion, effects of, on kidney, 111

Transplantation of bone, 280
 of fascia, 260
 of tendons, 258
 of tissue, free, 278

Trauma, relation of, to malignant tumors, 227

Treatment of cystitis, collargol in, 144
 of diphtheria carriers, 304
 of epididymitis, operative, 159
 of gastric ulcer, 30
 of general infection, 206
 of gonorrhea, iodine in, 153
 of hyperchlorhydria, 45
 of shock, 174
 of vesical tuberculosis by high frequency current, 143

Tuberculin, 395

Tuberculosis, 217
 Friedmann's cure in, 358
 peritonitis, 82
 pulmonary, camphor in, 331
 of skin, 272
 of stomach, 57
 typhoid vaccines in, 399
 vesical, treatment of, by high frequency current, 143

Tumors, 217
 of bladder, 142
 malignant, relation of trauma to, 227

U

ULCER, duodenal, 60
 deformity of outline in, 64
 hypermotility in, 63
 hyperperistalsis in, 63
 hypertonus in, 64
 lagging of, bismuth in, 64
 occult blood in, 62
 radiologic signs of, 63
 recurrence of symptoms, after operation in, 65
 scarlet red in, 393
 six-hour residue in, 63
 thread tests in, 63
 treatment of, 65

gastric, adrenals and, 26
 heredity in, 28
 localization of, 30
 perforated, 29
 recurrence of after gastro-enterostomy, 29
 scarlet red in, 393
 treatment of, 30

leg, fuchsin in, 362
 of stomach, 24

Uremia, venesection in, 404

Uremic constant of Ambard, 134

Ureter, new method of exposing lower end of, 142
 stricture of, 117

Urethra, posterior, lesions of, 151
Urethral chancre, 156
Urinary antisepsics, 166
Urobilin, 101
estimations in feces, 103

V

VACCINES, 397
in infections of urinary tract, 401
in skin infections, 401
typhoid, 398
in tuberculosis, 399
in whooping cough, 402
Vagotonia, 52
Vas deferens, anastomosis of, 164
Venesection, 402
in eclampsia, 404
indications for, 403
in uremia, 404
Venous transplant after resection of
aneurysm, 246
Veratrone, 405
Veratrum viride, 404
in eclampsia, 404

Veronal, 405
Vesical tuberculosis, treatment of, by
high frequency current, 143
Vessel suture, 235
Visceral lesions of purpura, 79

W

WHOOPING cough, vaccines in, 402
Wolff-Junghans test in gastric carcinoma,
32
Wounds, 188
accidental, 195
clean, 199
dressing, 197
gunshot, 188
operative, 197
unclean, 201

X

X-RAY diagnosis of gall-stones, 98
of liver, 92
studies of seminal ducts, 162
and tabetic crises, 59

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